BEFORE THE
CALIFORNIA ENERGY COMMISSION (CEC)

In the matter of   )
) Docket No. 13-ALT-01
Electric Vehicle Supply   )
Equipment (EVSE)   )
Interoperability   )

STAFF WORKSHOP
ON
THE STATE'S ROLE IN SUPPORTING
INTEROPERABILITY OF ELECTRIC VEHICLE SUPPLY EQUIPMENT
(EVSE)

Cal/EPA Headquarters Building
Byron Sher Auditorium
1001 "I" Street
Sacramento, California 95814

Thursday, August 15, 2013
9:00 A.M.

Reported by:
Kent Odell

APPEARANCES

COMMISSIONERS PRESENT:

Janea Scott, Lead Commissioner Transportation
   Leslie Kimura-Szeto, Her Advisor
   Jim Bartridge, Her Advisor

STAFF PRESENT:

California Energy Commission:
Jennifer Allen
Jim McKinney
Leslie Baroody
Charles Smith
Thanh Lopez

California Air Resources Board
Elise Keddie
Craig Childers

Randall Winston, Governor's Office
Richard Lowenthal, Chief Technology Officer, Chargepoint
Jason Wolf, Chief Executive Officer, Collaboratev
Brett Hauser, President, Greenlots
Cal Langton, Director EV Charging Infrastructure for NA, ABB
Rajit Gadh, Director of U.C.L.A. Smart Grid Research
David Peterson, West Coast Project Manager for Electric
   Vehicles, Nissan
Mike Tinskey, Director of Global Vehicle Electrification
   and Infrastructure, Ford Motor Company
Matt Zerega, Product Innovations Manager, San Diego Gas &
   Electric Company
Adam Langton, Senior Staff Analyst, California Public
   Utilities Commission
Paul Stith, Legislative and Policy Advocate, Plug in America
John Halliwell, Senior Product Manager Electric
   Transportation, EPRI
Bill Kramer, NREL
Rick Teebay, Los Angeles County
Dave Hawkins, Kn-Grid
Abdellah Cherkaoui, Hubject
Bill Boyce, Sacramento Municipal Utility District
Jordan Ramer, EV Connect
Craig Childers, California Air Resources Board

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1   P R O C E E D I N G S

2   AUGUST 15, 2013   9:10 A.M.

3   MS. BAROODY: Good Morning, I'm Leslie

4   Baroody. I'm the EV Program Manager in the Fuels

5   and Transportation Division of the California

6   Energy Commission. I'm really glad to see

7   everybody here today and I'm sure we have a

8   number of people on the Webcast.

9   Today's workshop is about the State's role

10   in supporting Electric Vehicle Supply Equipment

11   Interoperability. And we're looking forward to a

12   very informative day.

13   Let's go over the Agenda really quickly

14   and I'll explain what we're going to do today.

15   So we're very happy to have Commissioner Janea

16   Scott with us and Randall Winston from the

17   Governor's Office, and they will provide opening

18   remarks today. And then we have a very

19   distinguished line-up of speakers, quite a few of

20   them, I might mention, and we will have them come

21   up at 9:30 and they will present up until about

22   noon.

23   We will have two breaks, two 15-minute

24   breaks for questions, so we'll welcome questions

25   from the audience at that time. We'll have a

1 break at lunch for an hour, and then we'll come

2 back at about 1:00 for our two panels.

3   The first panel will be on the State's

4 role in supporting EVSE Interoperability, and

5 we'll have about six or seven panelists for that

6 and we hope that's sort of an interactive

7 conversation and we'll welcome your input during

8 that time, as well.

9   The second panel will be talking more

10 about hardware and network interoperability, more

11 the technical issues regarding interoperability.

12 So we'll also have a break after that, and then

13 time for questions and answers from the audience,

14 and public comment at about 3:45.

15   If you are interested in providing public

16 comments during this time, we have a sign-up

17 sheet out in the front as you come in and that

18 will be for about three minutes per person, and

19 we'll probably end at about 4:15.

20   So we look forward to this day, and right

21 now I'd like to welcome Elise Keddie, who has

22 graciously agreed to host this event in this

23 wonderful building, we're very happy to be here

24 today, so Elise will give you some logistical

25 instructions.

1   MS. KEDDIE: Good morning. I can't take

2   credit for hosting this on behalf of Cal/EPA, our

3   State Environmental Protection Agency, as well as

4   the Air Resources Board. We're happy to provide

5   the facility for today's workshop. ARB, of

6   course, is very interested in this topic and

7   we're always happy to be working with our sister

8   agency, the Energy Commission.

9   In terms of logistics, some of you are

10   familiar with this facility and some are not.

11   The restrooms are outside these back doors, and

12   then hang a left and a right. In case of an

13   emergency, lights will flash, an alarm will

14   sound, exit using the nearest available exit, and

15   proceed downstairs to the lobby, exit the

16   building, and the relocation space is Caesar

17   Chavez Park which is kitty corner to our

18   building. Then await there until we receive the

19   clearance to return to the building.

20   Other than that, welcome, we're happy that

21   you're here. I do want to give a special mention

22   to this morning's speakers. Just so you know,

23   because of the time sensitivity for the

24   presentations, I am going to be keeping time and

25   I'll be flashing a yellow card when you have a

1 minute left in your presentation, and a red card

2 when you're at 10 minutes. We're not going to

3 use any audible cues, but please be sensitive

4 that we've got a lot of folks to provide a lot of

5 information. There will be opportunities to

6 engage with folks during the break, as well.

7 Thanks again.

8   MS. BAROODY: Thank you very much, Elise,

9 appreciate it. And now I'd like to welcome

10 Commissioner Janea Scott.

11   COMMISSIONER SCOTT: Good morning. Thank

12 you, Leslie. Am I coming through on this? I'm

13 Commissioner Janea Scott with the California

14 Energy Commission and I'm the Lead Commissioner

15 on Transportation. I'm joined here today by both

16 of my advisors, actually, I've got Leslie

17 Kamerezita (ph) right here up front, and Jim

18 Bartridge right back there and one of the three

19 of us will be here all day.

20   In particular, my focus is on the

21 Alternative and Renewable Fuel and Vehicle

22 Technology Program, and I'm pleased to welcome

23 you to the Staff Workshop on the State's Role in

24 Supporting Interoperability for Electric Vehicle

25 Supply Equipment.

1   As most of your know, the Energy

2   Commission's Alternative and Renewable Fuel and

3   Vehicle Technology Program has been instrumental

4   in providing a robust deployment of charging

5   infrastructure throughout the state. Through

6   this program the Energy Commission has funded

7   more than $24 million to update over 600 legacy

8   chargers and install over 7,100 public charging

9   stations throughout the state. This network of

10   residential, public, workplace, and corridor

11   chargers is helping to jumpstart the California

12   Plug-In Electric Vehicle market, and it's helped

13   to make California a national leader in plug-in

14   vehicle adoption.

15   In addition, the program has funded 10

16   planning regions and coordinating councils

17   throughout the state to help support local

18   efforts to streamline the permitting and plan for

19   additional infrastructure, and to help educate

20   consumers, and we call that -- that's part of our

21   Readiness Program, so it helps people get ready

22   and prepare for Electric Vehicles.

23   In the Governor's 2013 Zero Emission

24   Vehicle Action Plan released earlier this year,

25   one of the actions says that the State should --

1 and I quote -- "encourage efforts to develop

2 Interoperability Standards for EVSEs that enable

3 Plug-In Vehicle drivers to locate and reserve

4 public charging stations and be built regardless

5 of drivers' memberships or subscriptions to a

6 network of Electric Vehicle supply equipment, or

7 the charging stations."

8   So there are a number of important

9 technical issues that we're going to consider

10 today. We have a bunch of experts here to talk

11 to us about that; thank you so much for coming

12 and joining us, and I'm looking forward very much

13 to today's discussion.

14   MS. BAROODY: Thank you, Janea, it's great

15 to have you here. And now I'd like to introduce

16 Randall Winston, he's from the Governor's Office.

17 Randall has been very involved in the development

18 of the ZEV Action Plan and he's also been well

19 acquainted with the subject.

20   MR. WINSTON: Where, Leslie, would you

21 like me? Here or here? Okay, great. Thank you

22 again, Leslie, and to the CEC and to ARB for

23 organizing the workshop. And thank you again to

24 everyone today for being here.

25   As Leslie mentioned, my name is Randall

1   Winston and I'm Special Assistant to the

2   Executive Secretary in the Governor's Office, and

3   I've been helping to facilitate the Interagency

4   Working Group on implementing the Governor's ZEV

5   Executive Order, as many of you here know.

6   I know I'm speaking to an audience well

7   versed in all things EV, so I just want to touch

8   upon a few things. First, the Governor's higher

9   level ZEV goals; second, a short timeline of the

10 Brown Administration's ZEV efforts to date and

11 how I think this workshop fits into the picture;

12 and finally, some of the key questions concerning

13 interoperability that I'm hoping you all can help

14 us chart a path to address.

15   Let me start by applauding everyone's work

16 here, and especially over the past year and a

17 half since Governor Brown signed his ZEV

18 Executive Order. We now have thousands of non-

19 private charging stations deployed in California

20 and for the tens of thousands of Plug-In Electric

21 Vehicles on the road. You're all part of the

22 reason why California leads the nation in PEV

23 adoption and charging infrastructure.

24   With that being said, I think you're all

25 also keenly aware that Governor Brown has set

1   some pretty ambitious goals for zero emission

2   vehicles and that there's still a lot of work to

3   be done.

4   So two milestones from the Executive Order

5   I think are particularly important to keep in

6   mind as we head into the workshop today, both of

7   which the Governor set for the year 2020. First,

8   that the state's ZEV infrastructure will be able

9   to support up to one million vehicles, again by

10   2020, and second, that ZEVs will be accessible to

11   mainstream consumers. Now, these goals call for

12   many thousands or tens of thousands more public

13   charging stations by 2020, coupled with the

14   education and awareness so that consumers

15   understand how to charge, where to charge, and

16   how much they're being charged, all in a

17   transparent and accessible manner.

18   Now, unsurprisingly, it turns out that

19   when you take hardware, software, networks and

20   protocols, then mix in some public funding, you

21   get a lot of opinions. And that's what we're

22   here today to sort through.

23   So standing back for a moment, the Brown

24   Administration is undertaking a number of efforts

25   to help us get to where we need to be with Zero

1   Emission vehicles and to reach our greenhouse gas

2   reduction goals. I'll mention just a few.

3   We organized the ZEV Stakeholder Summit

4   last September and produced the Governor's ZEV

5   Action Plan in February, which many of you took a

6   part in helping to draft. The CEC organized an

7   Infrastructure Workshop in January of this year,

8   and a Statewide Infrastructure Plan will soon be

9   released by the CEC in partnership with the

10   National Renewable Energy Laboratory. The

11   Governor's Office co-hosted a workshop on PEV

12   Financing in February of this year where we

13   sought innovative ideas for financing to help

14   reduce PEV costs, which the State Treasurer's

15   Office and the CPUC are currently continuing to

16   explore. We convened a stakeholder group to

17   draft the ZEV Planning Guidebook through our

18   Governor's Office of Planning and Research to

19   help local governments and municipalities

20   navigate the process of making their communities

21   ZEV ready. And, of course, the Brown

22   Administration is working hard to reauthorize and

23   extend both AB 118 funds and the Clean Vehicle

24   Rebate Program.

25   Now, to bring us to how we got to where we

1 are today, during the CEC infrastructure workshop

2 in January we had two breakout sessions on

3 interoperability in which a number of

4 recommendations surfaced as to what the state's

5 role should be. Some of these include supporting

6 national standards developed by the American

7 National Standards Institute and the National

8 Electrical Manufacturer's Association, supporting

9 Interoperability Standards and encouraging, but

10 not mandating interoperability, monitoring

11 industry standards development, encouraging Open

12 Chargepoint Protocol, and supporting the

13 continued use of EVSE network cards.

14   And from the Governor's Office standpoint,

15 within these recommendations I see three

16 interrelated groupings of issues: we have access

17 to charging stations, we have data associated

18 with charging stations, and then what, if

19 anything, the state should support through

20 funding or otherwise.

21   So in closing, I'll add some specific

22 questions to keep in mind. And, again, many of

23 these you've already seen or are in your

24 materials, but to reiterate, what should the

25 state prioritize in an EVSE solicitation to

1 support the development of network

2 interoperability, and what are the costs and

3 benefits? Should the State even provide support

4 for network interoperability through such a

5 solicitation? Should public funds only be spent

6 on systems that promote choice and avoid owners

7 being locked into a particular vendor? What data

8 should be made available to the public from state

9 funded EVSE? What payment methods should be

10 required? And what other requirements should be

11 put into place concerning State funds?

12   So with that, thank you all again for

13 being here and I look forward to an engaging and

14 fruitful discussion. [Applause]

15   MS. BAROODY: Thank you, Randall, for your

16 comments. That's great. So now we start our

17 speakers and our first speaker up is Richard

18 Lowenthal. He is Chief Technology Officer for

19 Chargepoint. And just a reminder, we'll do 10

20 minutes per person, and Elise is ready with her

21 cards. Thanks.

22   MR. LOWENTHAL: So thanks very much. I'm

23 the founder and Chief Technical Officer at

24 Chargepoint. I want to talk about this from our

25 viewpoint, what we think we need to do in order

1   to give the drivers the kinds of choices and ease

2   of use that they need. I would start with a

3   quote from the Governor's Action Plan, but I

4   think this is now redundant and you've already

5   heard about this. At least, what he wrote down

6   was about services for drivers, making sure that

7   drivers could find stations anywhere and use them

8   all easily, so that's where our energies have

9   been focused.

10   So during this long discussion, and it is

11 probably like an 18-month discussion, another

12 idea, another important issue has been brought

13 up, and I just want to separate the two to make

14 the conversation easier to understand. There are

15 two different kinds of things, there's sort of a

16 hardware interoperability thing which, if you're

17 a station owner you're interested in, and then

18 there's this driver interoperability; one makes

19 it so that you can interchange software and

20 hardware, that's OCPP, the other one makes it so

21 a driver can charge anywhere, so that's what I'm

22 focused on, this driver interoperability. So I

23 want to be sure that it's clear in people's minds

24 so that, as we discuss probably both topics today

25 you don't intertwine them too much. One of them

1   is for the benefit of drivers, the other for the

2   benefit of station owners. By the way,

3   Chargepoint supports both, so we've had OCPP

4   forever and we strongly support driver

5   interoperability, which allows drivers to charge

6   anywhere.

7   Okay, so another thing that I think is

8   important is why do drivers have accounts at all

9   because one route to go is to just make this pay

10 per use, use your credit card, and it appears on

11 the surface to be quite easy for drivers if

12 that's all they do is just sort of like a gas

13 pump, what's the point of having memberships and

14 accounts and all that? So I want to talk a

15 little bit about that. These are the charging

16 services that Chargepoint provides to drivers and

17 the top bunch here are all dependent on having

18 driver accounts, so if you want to get these kind

19 of services, they're aided by the fact that the

20 driver has an account. Somewhere he's signed up

21 to something, he's got something on the Web

22 somewhere, or on a server or whatever, that he is

23 affiliated with. So, for example, billing

24 software, if you want to have more efficient

25 billing, something like FasTrak, then you have to

1   have an account, just like you have to have an

2   account for FasTrak. That allows us, for

3   instance, to not pay a credit card fee every time

4   somebody charges, but only roughly every 20 times

5   that they charge, so it reduces the cost for the

6   driver because we don't have to pay credit card

7   clearing fees every time, just like it works for

8   FasTrak.

9   Reservations, you're going to know who

10   you're reserving for, so at some point -- I think

11   it's becoming an issue now for DC charging where

12   there's a queuing issue; you get to Harris Ranch

13   and there's three cars ahead of you, you can't

14   stop for lunch because you'll lose your place in

15   line, and you need to get your car charged. So

16   queuing and reservations are going to become more

17   important as this market grows because it takes

18   so stinkin' long to charge these cars. So it's

19   not like a gas station where you go in for 90

20   seconds and the worst you wait is 90 seconds for

21   somebody else to move. At our stations, even our

22   DC stations, the issue of queuing the

23   reservations is going to become severe over time,

24   so drivers will have to have an identity so that

25   they are waiting in line and they're known to be

1 waiting in line.

2   Smart Phone apps of course are important,

3 the driver wants to be able to locate stations.

4 I had to do that today and I had to locate a

5 station that was available to me to charge my

6 car. Authentication -- so for many places, you

7 know, there's a picture here of Google and a guy

8 at Google charging his car. Google only bought

9 infrastructure because they wanted it as an

10 exclusive perk for their employees, so they don't

11 want the guys next door at Microsoft to charge on

12 their campus. So they want authentication, they

13 want to identify that driver because it's for

14 free, but it's for free for employees of Google.

15 So they required authentication.

16   Energy management is going to become

17 important. I think this is the year of

18 converting and starting to do energy management,

19 things like Demand Response, but the driver is

20 going to need the option to opt in or opt out.

21 Today, for instance, I have to charge my car

22 because I've got a long way to go home, I live in

23 Cupertino, and I want my car charged up enough to

24 go. And today might be a day where I'd opt out

25 of Demand Response, where most days I wouldn't, I

1 would opt in. But the driver needs to have a

2 role in making decisions like that, so he has to

3 have a presence, so that's why he tends to need

4 an account that specifies his kind of

5 preferences. Like I'm a DR guy because I've got

6 a Plug-In Hybrid, and the worst thing that

7 happens to me is I'll switch to gasoline, so if

8 I've got a reduced charge.

9   Okay, the next thing, we provide a lot of

10 driver care. Many of you have stopped at our

11 stations before and called us up and said somehow

12 my car is not charging, or I can't find a

13 station, or whatever, and we've got 24/7 people

14 to help out drivers. And finally, monitoring and

15 statistics. So, for example, it happened to me

16 recently, somebody unplugged my car and I got a

17 text message on my phone saying your car was just

18 unplugged, which is important to me because

19 literally I won't get home for dinner tonight if

20 somebody does that today, so the driver knowing

21 what's going on with his charging is quite

22 important.

23   So this is why a lot of this complexity

24 comes out of the fact that there are these

25 valuable features to drivers that has the added

1 complexity of them having a presence somehow

2 associated with charging. The four on the bottom

3 have to do with station ownership, so those are

4 station owner benefits of having accounts, but I

5 didn't want to dwell on those.

6   So what do drivers want? They want to use

7 any station any time. It's quite clear they want

8 to locate and reserve stations, they want one

9 bill, or even integrated with an existing bill

10 that they pay. They want one credential, and you

11 don't want to have a key ring full of little RFID

12 tags. And frankly, they want transparency in

13 what it's going to cost them to charge that car.

14 So they don't want any surprises.

15   So our plan is to adapt to Collaboratev.

16 Now, if there is another clearinghouse or

17 whatever, that's fine, but we need to do some

18 work at Chargepoint in order to be able to

19 exchange the information necessary so that

20 drivers holding an account on our network can

21 charge anywhere, and drivers holding accounts on

22 other networks can charge on the Chargepoint

23 station, and that's what this is about.

24   Just for the benefit of the Energy

25 Commission, I itemized some costs here. The fact

1 is, it's going to cost us some money at

2 Chargepoint to do that, I think it amounts to

3 about $400,000 to do this project. A large part

4 of that is that we have to throw all of these

5 away because, once we go to a system where we're

6 all trusting each other because, you know,

7 somebody on a semi-connect account may be

8 charging on a Chargepoint station, we're going to

9 have to exchange money and all that, we have to

10 have security. These cards are very insecure.

11 They are as bad as your credit cards. And the

12 way credit cards work is people monitor where

13 you're spending all your money and they call you

14 with annoying calls and they stop your

15 transactions from going through. We want to do

16 this with a secure card that doesn't require all

17 of that. Unfortunately, those cards cost about

18 three bucks a piece right now instead of the .75

19 roughly that this costs us, so we have to replace

20 all of those because we have to use a secure

21 card.

22   What the secure card does is it connects

23 the driver back to his accountholder so that the

24 accountholder, maybe Chargepoint, maybe

25 SemiConnect, can authorize the charge. And so

1   you can't fool who there is, so it's very highly

2   secure with a challenge protocol and passwords

3   and keyed encryption. So anyway, that's part of

4   it. We know the way the Energy Commission likes

5   to work, they like us to put a share in there, so

6   we're hoping that through some kind of funding

7   mechanism the Energy Commission can offer to us

8   and our competitors, frankly, the ability to fund

9   what it takes for us to add interoperability to

10 our network. And I think that's all I had.

11 That's it. Thank you very much. [Applause]

12   MS. BAROODY: Thank you, Richard. Right

13 to 10 minutes, that was great. Our next speaker

14 up is Jason Wolf. Jason is Chief Executive

15 Officer of Collaboratev. Welcome, Jason.

16   MR. WOLF: It's good to see you all. So

17 good morning, my name is Jason Wolf. I've been

18 with Collaboratev all of three months, but have

19 been discussing Collaboratev or Collaboratev-like

20 functions for the last two years with

21 Chargepoint, with Ecotality. Those of you who

22 don't know, my previous background, I led Better

23 Place North America for five years and it was

24 becoming more and more a need as the networks

25 grew and we had this interoperability.

1   So the overall problems faced in this

2   crowd needs no introduction, we have multiple

3   networks, we have thousands of public chargers

4   out there, that is the scope that I'm going to be

5   talking about. There is, of course, in this

6   whole day we've spoken about three different

7   problems that Randall brought up very well,

8   there's how can drivers access all chargers, how

9   can we get data to find and locate these

10   chargers, and the third one which might be

11   related, is there a Government role? And that is

12   the specific topic today in those things.

13   So what does Collaboratev do? It's very

14   very simple. It's about how the driver can

15   access all chargers, find them, and charge.

16   Richard actually did a good job, and I saw some

17   of the other presentations of people that are

18   going to be talking about the problem, I don't

19   think there is disagreement about the problem, I

20   think there is a lot of positive discussion about

21   potential solutions. Collaboratev -- and I must

22   say this -- is one solution. It's the only one

23   today that is actually offering to solve the

24   problem. A lot of people are saying, yeah, if we

25   do this, or if we do that we will be able to

1 solve it, but obviously there is a marked gap in

2 being able to solve something that not any

3 individual company has to solve as they are

4 mandated, it is an intercompany, internetwork

5 issue for the driver. And that's important --

6 how do we make this -- at the end of the day, if

7 we zoom out our goal, all of us, it's to get to

8 mass adoption of EVs. That's our ultimate goal.

9 So one of the key problems, not the only

10 one, is how do you allow a driver to access and

11 find every charging station, and I think there is

12 consensus about that. How it's done is what I'll

13 talk about.

14 The solution that Collaboratev is

15 proposing is as an independent entity, an

16 independent entity. I've heard a lot of

17 discussion about, you know, it was founded and

18 funded initially by Chargepoint and Ecotality,

19 there's a lot of open doors to come in and fund

20 this by other entities, this is an independent

21 organization that will do a few things, it will

22 welcome all operators, so anybody who wants to

23 enable their drivers, like Richard mentioned, to

24 be able to roam in other networks, will be

25 welcome here. The collection of the Chargepoint

1   data will be inherent in that; as you become an

2   affiliate, part of this virtual network, you will

3   also be obliged to provide your data to a single

4   place, which today doesn't exist. Today it's a

5   multi-lateral or bilateral multi-times event to

6   try and aggregate all the data. As a longtime

7   *Leaf* driver from late -- wow -- 2010, 40,000

8   miles, I can't trust only Car Wings, I can't only

9   trust Chargepoint, I can't only trust PlugShare

10 to find and know what chargers are out there. So

11 having a central point of interest database like

12 Randall mentioned is a critical element for

13 enabling drivers with authentication and

14 authorization in real time, being able to allow

15 people to come in and say, "I'm not belonging to

16 that network."

17   Collaboratev doesn't know -- and this is

18 important -- doesn't know who that person is, but

19 it can authenticate against its home network and

20 say you're authorized, and be accountable to make

21 sure that that transaction information gets sent

22 back to the host, so the host can aggregate all

23 of its members, regardless of where they charge

24 and then supply that data back to the driver.

25   Aggregating all of those roaming

1 transactions and clearing, one of the key

2 benefits of course is reducing the price, not

3 doing a credit card transaction which, by the

4 way, is always an option. So you can always opt

5 to do a credit card transaction, but it's not the

6 most efficient way for the driver and definitely

7 not for the industry.

8   And then finally, once all that roaming

9 and clearing is done, it's going to be very

10 important to do it based on Open Standards and

11 the reason is quick on ramp/off ramp, so today

12 Nissan or Ford can go and look at the NEMA

13 Standard once it is finalized and implement the

14 data APIs on their side, and know that

15 collaborative, or if they don't want to use

16 collaborative, any other party that they want

17 bilateral agreements with can use that same API.

18   I must say, this is different than your

19 slide, there are logos here that belong to

20 companies, I use them and I specifically put the

21 early affiliates, but in order for Collaboratev,

22 which is as close as you can to nonprofit, it is

23 a for profit, but as close as it can, it needs

24 more players. Ecotality and Chargepoint have 85

25 percent of the public charging, that's a great

1   start, it's a very important start for drivers

2   because those are what the drivers are using

3   today for the most part, but this industry is

4   young and it's going to grow and there's going to

5   be lots of players, and everybody knows that.

6   Finally, we spoke about the POI database,

7   this is a critical element, to be able to

8   aggregate all that data and distribute it.

9   Today, NREL collects that data, nothing changes,

10   they will still be able to collect that data, the

11   only difference is there will be an accountable

12   owner that will provide the real time data and

13   make sure that that data is accurate. There's an

14   accountable one owner that can provide it to

15   everybody. Again, important, this is not B2C, we

16   do not -- Collaboratev does not create apps and

17   doesn't show the users, the drivers; we enable

18   the enablers of the drivers, whoever they may be.

19   And the driver will select who is the best

20   network, who is the best app, and be able to

21   charge anyway.

22   Okay, I'm going to briefly just talk about

23   three key philosophy points for Collaboratev, and

24   these are key things for success. One is

25   simplicity to the driver. That has to be the

1 mission and it has to be the focus of this

2 organization. This is a tiny organization, it

3 will always be a tiny organization because it's a

4 facilitator more than a growing enterprise. And

5 it has to see that that process of the driver is

6 at sight first.

7   The second thing, if it wants affiliates

8 to join, operators and industry stakeholders to

9 join, it's going to have to be very open and

10 transparent. And I think, frankly, that's

11 probably my biggest challenge today is there's a

12 lot of objection not because of objection about

13 what we're doing, and you can see this in some of

14 the comments, it's about the lack yet -- there's

15 no built trust, there's no knowledge that this is

16 going to be good for me, so that's an important

17 second thing.

18   And then the third thing, of course, is

19 always building it based on industry-wide

20 standards.

21   Finally, the last slide, what we're asking

22 the Government to do. And this is the specific

23 answers. So solve the question at hand, the

24 first thing. We're talking here about really two

25 big questions and, you know, I'm not going to

1 make an opinion on the OCPP and obliging OCPP or

2 not obliging, I have a very clear opinion, but

3 I'm not going to make it here because that's not

4 the topic, it's about roaming. I wouldn't call

5 it interoperability because it's really about

6 driver roaming; it is interoperability in a

7 sense, but that's too technical. It's about

8 allowing drivers to access every charge spot.

9   And to me, that is the real problem and

10 that's the real market problem. There is a real

11 problem on stranded assets and whatever you want

12 to call it, but that is a problem like Fisker

13 went out of business, it's a technical problem

14 that a site owner can decide, "I want to choose a

15 product with OCPP," or, "I don't want to choose."

16 I personally don't see a need for Government

17 there. I definitely want all of those things to

18 happen as a EV driver, but the problem with

19 drivers being able to find and charge in any

20 station, every network wants that, but not any

21 network can alone do that and that's why there is

22 a market problem that needs to be solved.

23   I wouldn't look at California's success of

24 the past and just say, "Oh, Europe is doing this

25 better; Asia is doing this better." By the way,

1 somewhere they did five years of international

2 EVs. U.S. is actually doing it the best and

3 California is doing it *the* best, and I'd be happy

4 to argue with anybody in the world in this room

5 or anywhere that that is the case, even that gas

6 prices are half the price here. So don't knock

7 your own success. ARB and EPA has done an

8 amazing -- ARB and CEC have done an amazing job.

9   Minimize EVSE solicitation. The ability

10 to upgrade for the networks, not for

11 collaborative, for the networks, is a real cost

12 as you saw from Richard. Pay those real costs as

13 a cost share because that enables in-kind.

14 Collaboratev could be a competitive entity. Do a

15 competitive bid, let anybody come with a

16 solution, look at the solutions and decide which

17 is the best, don't choose Collaboratev

18 immediately. And finally, I would go with the

19 route of trying to let the industry solve it

20 rather than create a government entity that will

21 enable roaming as a first option. If it doesn't

22 work, the Government can always step in. Thank

23 you. [Applause]

24   MS. BAROODY: Thank you, Jason. Next up

25 we have Brett Hauser. He is President with

1   Greenlots. Welcome, Brett.

2   MR. HAUSER: Good morning, everyone.

3   Thank you for coming. Just as Richard did in the

4   beginning, I want to make sure we understand the

5   delineation between the concepts because

6   interoperability means different things in

7   different sections. There's interoperability

8   between the car, the EV, and the EVSE, which

9   we're not discussing today; and then there is

10   driver interoperability which is roaming, which

11   is what Jason just eloquently spoke about; and

12   then network interoperability and how to

13   communicate between the charge station and the

14   network backend.

15   You know, I think I could probably stand

16   here and spend the next 10 minutes talking about

17   these two slides here because I think this

18   identifies all the challenges we've had with this

19   industry up to this point, yet also it can

20   provide the inspiration for what we need to do

21   going forward. What we have here is a sign of

22   what happens when we have, you know, a nascent

23   industry that has initially deployed Proprietary

24   Networks, proprietary technologies, and that

25   ultimately there's going to be winners and losers

1 within that. And the challenge is how are you

2 able to scale beyond that. And when you have

3 some of these winners and losers, as the market

4 will bear out, the last thing we need is for

5 these things to become stranded and not able to

6 be utilized in the marketplace, and right now

7 that's what we've been dealing with. In Maui,

8 OpConnect specifically has been dealing with that

9 now and I hope -- I do truly hope that Ecotality

10 after an announcement this week is able to

11 provide additional funding and keep going as a

12 going concern. But if not, they've got 12,000

13 assets out there today, and approximately 3,600

14 of those are in the commercial area. And we've

15 put a lot of money -- the DOE has put a hundred

16 million dollars into that, the last thing we need

17 to do is take additional funds to replace those

18 charge stations. What that money should be used

19 is to deploy additional charge stations on the

20 network. And as we've seen in Maui with

21 OpConnect, what they're doing right now is having

22 to pull out the better placed charge stations and

23 put new infrastructure in and we hope the same

24 doesn't happen with Ecotality, as well. The way

25 to avoid this is in fact using Open Standards.

1   At the end of the day, Greenlots is a network

2 management provider. We have a great solution,

3 but I believe that we should be based -- a

4 customer should be able to choose our solution

5 based on feature, function and price, and then

6 they should be empowered to make the decision to

7 go with us, and then if they don't like us, they

8 should still be able to switch.

9   The challenge with these charge stations

10 that have been put out there with the proprietary

11 protocols is that, once you've gone down that

12 path you're stuck. And you've got a vendor lock-

13 in so that you cannot make a switch. You can't

14 change. So those Ecotality charge stations that

15 are out there, you can't switch from Blink to

16 another network provider because they've got the

17 proprietary protocol, the communication from the

18 network back office to the charge station is

19 proprietary. So because of that, the only way to

20 enable that for another solution is, in fact, to

21 either rip out the communication board, or put a

22 new charge station in altogether. Again, it's

23 taking new dollars to fix an old problem and a

24 problem we could have avoided. If these had been

25 based on Open Standards, then all these site

1 hosts would be going out now possibly for

2 solicitations to find additional network

3 management companies that could provide the

4 network capabilities that they need, and they

5 wouldn't have to make any changes to the hardware

6 at all.

7   So this slide, I think, has served well to

8 give -- it's basically a high list checkpoint of

9 where the issues come in. Having open networks

10 also provides for innovation. Again, if we have

11 to compete on price and features, then we're

12 going to do the best we can and we have to earn

13 our customers' business every day. If we don't

14 have that and we've got a customer lock-in, the

15 prices can go up and the return we're going to

16 get on that investment will be minimized.

17   So moving from Open Standards, there's the

18 discussion about why OCPP because there are a lot

19 of Open Standards that could possibly fit this

20 role. OCPP was founded by the Dutch consortium

21 E-LAAD, it's a consortium of the energy companies

22 in the Netherlands and they had previously had

23 proprietary systems rolled out and faced some of

24 the issues that we faced already. So to avoid

25 those problems and having the stranded assets

1 again, they all came together and developed the

2 OCPP Forum, which is not for profit. The

3 technology, the protocol is relatively free.

4 There are no fees for using it, you could take it

5 and you could build off it yourself if you wanted

6 to, but it's out there for the public to use and

7 it's got representation from 50 different

8 countries, it's mandated now in the European

9 Union. Any tenders that go out for public

10 infrastructure, one of those requirements is that

11 that charge station has to be OCPP compliant or

12 it cannot be considered for that tender. And

13 then you can see that, you know, ABB, Eaton,

14 Schneider, and other Tier 1 power equipment EV

15 charger manufacturers are in fact starting to

16 adopt this as their de facto standard.

17   I do want to talk about the criteria for

18 adoption with respect to roaming because that has

19 been a big part of the conversation. And we

20 haven't commented on it too much to this point,

21 but at the end of the day, are we over

22 complicating the process? I mean, we're trying

23 to fundamentally change consumer behavior for a

24 nascent industry that has enough activity and

25 enough things that we need to do to impact the

1 adoption as it is. I mean, I don't know the last

2 time someone had to have a subscription to buy a

3 can of Coke at a Coke machine, right? But Coke

4 machines, you know, buying movie tickets, all

5 these things, buying gas, we're all used to using

6 the credit card and that's not going away. So

7 I'm not saying we should be doing away with

8 subscriptions by any chance, but as opposed to

9 trying to change consumer behavior at the

10 beginning, why don't we try to understand what

11 their paying points are, what they're used to,

12 and try to cater to that. That's the best way to

13 promote adoption of Electric Vehicles and the

14 infrastructure.

15   Again, subscription models, I think they

16 had their challenge, they are limited. With that

17 being said, I know Greenlots provides, and I

18 think multiple players out there, as well,

19 provide various payment options. You can have an

20 RFID card. Mobile apps, you know, in scanning QR

21 codes, that's something that we are heavily

22 involved in and support, and that's the easiest

23 way to do it. Someone can just download the app

24 free of charge from iTunes or the Google Play

25 Store and then you can start authenticating, and

1 pay by phone. And, of course, credit cards. For

2 the money that we're looking to use to upgrade

3 the RFID cards for the existing networks, you

4 could deploy a Cloud-based credit card solution

5 on all the existing charge stations out there in

6 California and have the same effect. Right now,

7 if you look at the public statistics for what's

8 been rolled out with the Government funded

9 programs, the utilization of those assets,

10 meaning the charge stations, are being used less

11 than five percent of the time they're available.

12 So that's not a lot. And going too far as to try

13 to put in a significant and what I would call a

14 complex at time protocol and procedure for

15 interoperability when, yes, it's somewhat of a

16 pain point, but credit cards could do just as

17 well and probably more effective because that's

18 what we're used to. I think that's probably the

19 short term solution as we let this industry

20 evolve and see what the true pain points are.

21   SB 454, which is now going through

22 legislation, I mean, that again, we can discuss

23 the merits of the bill during the afternoon if we

24 like, but one of the things that they have done

25 is really defer on trying to adopt an

 1 interoperability standard until 2015, and they're

 2 giving it a year to be implemented. And that's

 3 because there's too much time ahead of us, right?

 4 We have so many things that we're just learning.

 5 Side hosts are now just getting involved in

 6 deploying infrastructure. You know, from their

 7 side Open Standards means I can go with a

 8 solution, I can get smarter on what I need, and

 9 then if I don't like what I have, I can switch

10 and I don't have to replace the hardware. So too

11 for the interoperability requirements that are

12 going to be put in front of us; we don't know

13 exactly what's going to be required, we think we

14 have an understanding, but how much money should

15 we spend now to lock ourselves into a particular

16 approach and solution when, in 12 to 24 months,

17 you know, the winds could change, we could see

18 that there's a clear way to do it? Having a

19 single point, a single clearinghouse, has its own

20 inherent risks. If that clearinghouse goes down,

21 how does any transaction get processed? There

22 are a number of other solutions out there that

23 are more like a distributed network, kind of like

24 Internet security when you get authorized to look

25 at different websites, the same type of thing.

 1   We have to explore all those options and I think

 2   that's going to take some time because there are

 3   experiences that are out there, not only in North

 4   America, but in Europe, as well, and obviously I

 5   think we're doing a phenomenal job here. There's

 6   nothing wrong with shared learning experiences,

 7   right? If someone has done something and we can

 8   learn from it, why not? We don't have to make

 9   the same mistake twice. So if we can learn and

10   leverage that experience, I think we'll all be

11   better off. But let's not rush to judgment on

12   the best way to handle situations and use cases

13   that we really haven't been confronted with yet.

14   I think what we need to do now is make sure that

15   we set ourselves up for the utmost flexibility

16   and scalability for the infrastructure in the

17   future, without adding a lot of costs that we're

18   ultimately going to have to pass through to the

19   consumer because it's a very price elastic space

20   and consumers are only willing to pay so much for

21   their electricity, and if we don't have them

22   charging, none of us are going to have a

23   business. So world domination is great, but 80

24   percent of zero is still zero the last time I

25   checked, so we've all got to do our part to make

1   sure that we move this industry forward.

2   The key takeaway here is, again, de-risk

3   the opportunities for the site hosts and for the

4   drivers by making sure that Open Standards are

5   employed throughout the state for any public

6   vendors and, in lieu of another alternative,

7   right now it seems that OCPP is the best one for

8   the state to consider. And thank you for your

9   time. [Applause]

10   MS. BAROODY: Thank you, Brett. Next up

11   we have Cal Langton. Cal is Director of EV

12   Charging Infrastructure for North America with

13   ABB.

14   MR. LANGTON: Good morning, everyone. So

15   I think we've got a lively and balanced

16   discussion, so I'm going to bring another

17   perspective into this and focus kind of on the

18   second layer that Richard mentioned, and I have a

19   couple more views about that, so I apologize in

20   advance if some of you have seen my slides, but

21   we only have one trick, I guess you have to use

22   it again and again.

23   I will quickly introduce ABB, which as I

24   like to call is the biggest company no one has

25   ever heard of. ABB is a global manufacturer of

1   electronics equipment, a global supplier. We

2   have about 140,000 employees in 100 countries,

3    $45 billion in revenue, and I think about 30,000

4   employees in North America alone, so quite a

5   broad reach and obviously EV charging is just one

6   small component of what we do.

7   My focus, or our focus has really been

8   obviously from a European perspective, so I came

9   here last year after spending some time in Europe

10   to start up our U.S. operations, it's a

11   relatively new player in Europe, and I'm going to

12   focus a little bit about our experiences in

13   Europe; again, it provides an example, not

14   necessarily a better example, but an example of

15   how things are going, how the industry is going

16   in Europe where we have very large projects

17   rolling out utilizing these Open Standards. So

18   globally we've shipped over 1,000 DC fast

19   charging systems across a number of different

20   types of applications from large public tenders

21   to small five unit tenders for a gas station, a

22   mom and pop kind of gas station in the

23   Netherlands, and now also working on the utility

24   projects and behind the fence OEM projects in the

25   U.S., as well.

1   Why is this market important for ABB?

2   Obviously for us it's more than just the charging

3   hardware, we also have a networking management

4   system that provides the ability to do this

5   interconnection on an open basis, on a business-

6   to-business level, so not a competition with

7   Chargepoint or Collaboratev, but more on the back

8   end side, and then that ties into a larger part

9   of ABB's offering around energy storage, smart

10   grid integration, Demand Response -- Richard

11   mentioned those, as well -- and then more to the

12   iron side of substations, renewable integration

13   components and things like that.

14   So this is the slide that you may have

15   seen in the past. So I think we've actually kind

16   of covered this already and I'm glad this

17   confirms our view, as well. So for me there's

18   three main spheres of the market and how they're

19   connected, and I think there are standards on all

20   those sides. So there's three main layers of

21   standards, we've covered those, one is the actual

22   vehicle hardware itself, so CHAdeMO, CCS, GV

23   Standard in China, three phase AC Standard for

24   Renault in Europe. Then there's the

25   interconnection standard between the hardware and

1   the backend networks, and that's OCCP and

2   equivalents, and then there's the interconnection

3   with the driver itself, and that's the

4   Collaboratev offering.

5   So this kind of ties in together. This

6   focus here is obviously on the connection between

7   the hardware and the software to tie the consumer

8   networks together, and that intersection of those

9   three circles is where we feel standards like

10   OCPP reside and their equivalent. So our

11   position in ABB is we provide the charge and

12   management functionality, so that's the hardware,

13   and then detailed hardware management

14   functionality. So what we do best is manage the

15   hardware, remote maintenance diagnostics, things

16   like that. We can provide integration to grid-

17   side functionality, so that's Smart Grid,

18   Operational Grid Management, Demand Response,

19   Distribution System Management, and then that

20   interconnects via those Open Standards to billing

21   authentication, subscriber management, and then

22   the operational B to C services, which is all the

23   reservation driver services and things like that

24   which different systems offer.

25   I think one of the points I do want to

1 make, though, is there's an important

2 distinction. So if you look off to this slide,

3 so the bottom left corner would be kind of where

4 the conversation sits around Collaboratev and its

5 alternatives. In the middle is the OCPP piece,

6 and while that is separated by one layer from the

7 consumers, I feel that the Open Standards push

8 and the Standard push, in general, does

9 ultimately benefit the consumers. So the point

10 of OCPP, while it does more viscerally and

11 immediately benefit the station owners, all of

12 that flows downstream to the users, as well. I

13 mean, you know, Brett did bring up the example of

14 stranded assets, so stranded assets are a backend

15 interoperability issue, but obviously that

16 affects the consumer. The other piece is the

17 presumption is that the increased choice at the

18 station owner level would drive down costs and

19 thus lower cost impacts on the consumers, as

20 well. So I do want to make that important point,

21 which I think is those Open Standards do provide

22 benefit to the consumers.

23   So this says ABB in the middle, I don't

24 want you to think we're the only ones doing this.

25 You know, Brett brought up the point there's

1   other manufacturers, so this provides a more

2   linear example of that integration piece we're

3   doing with different network providers, so ABB

4   provides the charging infrastructure, the

5   hardware platform connects to the vehicles

6   themselves, and then we integrate with the

7   solutions to run a network, and that can be

8   anything, I think. One of the reasons we

9   positioned ourselves there is it's a very

10 competitive space. You have everyone from

11 obviously the pure plank organizations like

12 Chargepoint, two of the larger companies like

13 IBM, Visa, SAP, and then that also ties into the

14 Smart Grid functionality, so Ventex is a Smart

15 Grid provider, for example, where we have demand

16 response integration. So we can provide that

17 service in conjunction with, or on top of, or

18 aside some other kind of consumer functionality,

19 all integrated via Open Standards in a very

20 simple manner.

21   So what does that mean? So the APIs, we

22 really already covered this, so they're royalty-

23 free, widely available via the Internet, but with

24 global standards, so flexible, secure and

25 reliable, and that makes it easy to connect to

1 different back offices, you can adapt them to the

2 latest energy developments, and you can also do

3 onetime integration, so adding a charger or

4 scaling your system is really a non-event.

5   Security, so obviously security is a major

6 topic here and we need a system that's going to

7 meet all the relevant ISO standards and be as

8 secure or more secure than a credit card

9 transaction, which is what is offered by OCPP,

10 and then reliable, so it has to have end-to-end

11 performance monitoring from both ends, so that

12 means that the network side and the hardware

13 side, there needs to be an ability to do API

14 services, and you have to be able to access your

15 data as the station host site owner.

16   So for ABB, what are we doing right now

17 and what's the current state of OCPP globally?

18 So right now we have 23 different OCPP

19 implementations running worldwide, so I think

20 that provides a little bit of an example that

21 it's really building momentum and that it is a

22 very wide customer base. As Brett mentioned, the

23 requirement has really already been set across

24 the EU that publicly funded projects support the

25 use of Open Standards, OCPP being the prevalent

1 Open Standard; obviously there are other

2 available Open Standards, but it's the

3 availability of OCPP and the usefulness of OCPP's

4 position as the de facto Open Standard for these,

5 and it's actually specified specifically in all

6 these open tenders. The basis for that choice, I

7 think, is pretty clear, it's the judicious use of

8 public funds and now even private funds to

9 provide future proof solutions such that hardware

10 can be added and removed in a cost-effective

11 basis, without compromising the integrity of a

12 system and enabling the system to grow in the

13 future. So that's the whole drive in Europe upon

14 the OCPP push, and it's been covered pretty well

15 here already. I just want to make it clear it

16 really is happening right now, so pretty much all

17 of our projects going forward in the EU are OCPP-

18 based integration. So you may have heard in the

19 news we're doing right now -- I didn't put it in

20 the slides here, but just as a little note, so we

21 just announced a 200-unit project in the

22 Netherlands, government supported, but it's

23 government supported only in the sense they're

24 providing an in-kind contribution of access to

25 roadside gas station areas. So if you've been to

1 Europe, you know they have mildly fancy roadside

2 gas station areas, so they provide basically a

3 concession and there was a public bid for that,

4 but it's a private company that is doing that

5 work, and they're the ones that put out the

6 tender and the company called Fastnet, so that's

7 200 DC fast chargers with the combined combo

8 CHAdeMO outlet is one latest example, and then

9 all the way back to our first major global

10 project in the country of Estonia, also using

11 these OCPP Standards. And they've been able to

12 then add chargers, so ABB -- I mean, I'll just be

13 honest here, we have a very strong focus in DC

14 fast chargers, but there's more competitive AC

15 charging offerings out there. So these countries

16 like Estonia and then Fastnet, for example,

17 they'll bring in other manufacturers for their AC

18 charging needs while then supporting ABBD fast

19 charging.

20   One of the common criticisms on the

21 customer demand side is that SEP does not provide

22 the full level of functionality. I think that's

23 a valid concern, but we're seeing SEP 1.2, 1.5

24 provide the functionality for 98 percent of the

25 use cases, and then now the future of

1   functionality with SEP 2.0 has really been

2   designed to meet those ongoing concerns. And

3   then obviously performance and availability

4   really has been a non-issue. So, Randall, to

5   answer your question directly, do I think that

6   the State has a role in mandating the use of Open

7   Standards for future solutions, I think they do,

8   I think there's a good lesson to be learned from

9   Europe in this, so if you look at a judicious use

10 of taxpayer money, then I think that OCPP or Open

11 Standards, in general, provide an example

12 forward. So thank you very much, I look forward

13 to your questions. [Applause]

14   MS. BAROODY: Thank you, Cal. Next up we

15 have Rajit Gadh. He is Director of the UCLA

16 Smart Grid Research Center. Welcome.

17   PROFESSOR GADH: Thank you very much. I

18 guess I have the luxury of stepping back and

19 thinking about things and not have the sense of

20 urgency that, for example, some of the folks in

21 industry have to have in meeting their quarterly

22 revenues, profits and losses, and so on and so

23 forth. So my comments will be a little bit

24 different in nature.

25   Just a quick introduction, so my name is

1 Rajit Gadh. I'm a Professor in UCLA and Founder

2 and Director of the Smart Grid Energy Research

3 Center.

4   And I would say one of the most

5 significant areas of research that we have is

6 integration of Electric Vehicles into the Smart

7 Grid of the future. And we have several

8 different products in the Smart EV charging space

9 and Smart EV discharging space, and one of them

10 is funded by the Department of Energy through the

11 L.A. Department of Water and Power, it's a $60

12 million Regional Demonstration Grant that we are

13 part of with LADWP being the lead.

14   Where are we headed in five, 10 years? I

15 think we need to ask that question. What would

16 we like to see in five or 10 years? And you

17 know, I'm an engineer, so one of the first things

18 I did many many years ago, about a decade ago,

19 was ask my students to open up a charging station

20 and open up three or four models and look inside

21 and predict 20 years from now what should this

22 device look like, what can they visualize, what

23 can they envision, and what it would cost.

24 Today, I think, you know, in 10 years can we

25 predict the cost of a Smart EV Charging Station,

1 a Level 2? And I've told my students why can't

2 it be a hundred bucks, why can't it be fifty

3 bucks? So, I mean, if it is $100.00, are we all

4 better off? Are we worse off? So those are the

5 kinds of questions I like to ask. And I think a

6 Smart EV charging stations in a few years is a

7 hundred bucks. I mean, everybody will install it

8 everywhere and the problem of being ubiquitous

9 will get solved.

10   And, of course, we need standards, we need

11 interoperability. If you look at WiFi, we had

12 something called Wireless LAN Proprietary

13 Networks in the '80s and '90s, and to set up a

14 wireless LAN network for a facility of this

15 nature, you might spend thousands of dollars in

16 those years; well, today you just put a WiFi

17 access point for thirty bucks and you're ready to

18 go because both sides are talking the same

19 language, your laptop and your cell phone are

20 talking the same language.

21   So what do you do? You start creating

22 modules, you create partitions, you create

23 interfaces, you create standards. You know, OCPP

24 is one standard, and Richard said, yeah, this

25 supports OCPP. My research, yes, I also support

1 OCPP, and I support a bunch of other standards.

2   So overall, what's the vision? My vision

3 is that electric vehicle charging -- and I think

4 my vision is sort of similar to Cal's vision from

5 ABB where there is an EV operator and an EV, and

6 there's a Grid operator, and then there is a

7 garage operator where you install the charging

8 stations. And in UCLA we are creating

9 optimization algorithms to be able to figure out

10 how many amps to support in which car, when,

11 based on the user preference, based on what's

12 happening on the grid, and based on what's

13 happening in the garage. And everybody has their

14 input, and that's the optimization engine that we

15 have been working on for many many years, and we

16 are a research lab and we experiment with things

17 and so on and so forth.

18   Interoperability. So one of the things

19 our students developed many years ago was a bunch

20 of apps, of course. The app is the

21 quintessential entity if you are dealing with

22 consumers, you've got to have an app. And

23 through the app, the user can provide you with

24 their inputs, and the system can give them

25 feedback, oh, you know, the price of energy has

1   gone so high, or, you know, you are not 50

2   percent charged, and so on and so forth. So that

3   is very critical.

4   Now, should the apps be interoperable?

5   Right? I mean, when we're talking

6   interoperability -- and someone pointed out, what

7   do we mean by interoperability? And I'm going to

8   say what Brett said, you know, let's not rush to

9   judgment, I say let's not rush to judgment on a

10   lot of different things, and maybe the interface

11   between a mobile app and the server or the Cloud,

12   should that be interoperable? Why not?

13   Communications. No one talked about

14   communications. You know, we all take for

15   granted there's 3G, there's 4G, there's WiFi,

16   there's PLC, there's Zigbee, there's an entire

17   bunch of standard communications protocols,

18   right, and then there's the new stuff coming out

19   from companies like Silver Spring that plug into

20   Smart Meters. Well, that's another type of

21   standard.

22   So the question is, on the communications

23   side, what should be interoperable with whom,

24   how, where? So that's another issue that I like

25   to bring up. At UCLA, for example, as part of

1 our research project, we have now more than 50

2 Smart Nodes -- I call them Nodes because you plug

3 in a car, it's the end of the network, right?

4 You can monitor the car, you can send signals to

5 the car, you can send signals to the mobile app,

6 so we have about roughly 50 or so EV owners in

7 the Grid to LA region, so you can see the maps,

8 you can see where they are, and these are all

9 research units and, you know, between Santa

10 Monica and Pasadena, and so on and so forth, so

11 this is the regional network that we are using to

12 test and demonstrate the concepts.

13   And again, I think we are in the early

14 stages and we have to have a lot of collaboration

15 in our adjacent Collaboratev -- I don't know how

16 to pronounce the company -- but it's about

17 collaboration. And so you have to have a lot of

18 collaboration and I think that's very critical.

19   Interoperability at the data gathering

20 level, we're gathering data, we're getting small

21 bits of information and perhaps OCPP is

22 sufficient for that and that may be fine, that's

23 energy information, voltage, and so on and so

24 forth, maybe a messaging scheme can actually

25 work, so I would say that that may be fine, or it

1   may not be fine, right? But we have to

2   investigate further and I argue that, Randall, I

3   think the question what should we be thinking

4   about, I think we should be thinking about having

5   some research technology development, you know,

6   demonstrations, innovation, and bringing

7   different partners together to be able to do

8   that. So this, for example, is our control

9   center. And all of you, you all have your

10 control centers with your own data formats and

11 things like that, so maybe a control center from

12 Company A needs to work with the control center

13 from Company B, maybe one is Cloud-based, the

14 other is not, but there are a lot of interfaces

15 that can be developed.

16   At the hardware level, okay, so for

17 example, what we did is our students I challenged

18 them and I said, hey, can you take -- our

19 students developed hardware -- so I said, well,

20 can you take a commercial hardware like a Clipper

21 Creek, and take your Cloud software and connect

22 it with Clipper Creek? Well, guess what? In a

23 few days, they did it. They built a small

24 electronics box, a little thing like this that

25 you can plug into a Clipper Creek installation

1   and, lo and behold, the Clipper Creek becomes

2   Smart. Again, so there's a lot of very

3   interesting concepts that can come out when you

4   do research and development in the academic

5   world.

6   Interoperability at the parking and the

7   garage level. Now, this actually has to do with

8   Demand Response, for example, aggregation, when

9   you have a large number of vehicles in a garage

10 -- again, I'm looking into the future as an

11 academic -- you know, we are aggregating large

12 numbers of EVs, for example, and one of my

13 garages has over 15 or 20 EVs -- what can we

14 offer them? And I go back to, for example,

15 Demand Response which is what Cal was talking

16 about, and that's another big area of research

17 for me, so we have made the system open ADR-

18 enabled. Open ADR is a Demand Response protocol,

19 so it's an Open Standard, happens to be an open

20 Standard, you know, there can be Standards, there

21 can be Open Standards, there can be Open Source,

22 so a lot of these things we still need to figure

23 out what is going to actually win in the end. I

24 think it's a little bit early to tell. But in

25 any case, when you start to aggregate at the

1 garage level, what protocols will the garage

2 accept? Will it be open ADR or will it be

3 something else? So one of my parking garages has

4 12 or 13 charging stations.

5   At the Architectural level, so now I'm

6 getting into the details of the technology,

7 right? You guys are talking about you guys are

8 trying to serve the customers and do the billing

9 and so on and so forth, and I stay away from

10 that, and that's a well understood problem, but

11 I'm looking at the guts of the problem, I'm

12 saying, "Can I take software from Company A,

13 hardware from Company B, and communications from

14 Company C, walk into Best Buy and for $100.00 I

15 have a charging station, Smart Charger?" Why

16 not? Plug and play. If the architecture

17 supports it, like the solar folks have been doing

18 plug and play, so if the architecture supports

19 it, can you just have plug and play concepts

20 that, for example, you know, maybe the IT system

21 supports Level 1, Level 2 and Level 3, so for

22 example in UCLA I already have demonstrated Level

23 1 and Level 2 charging stations integrated within

24 the same IT framework and the architecture, and

25 now we are adding a CHAdeMO. We just got a

1 Nissan box and we're going to add it and it will

2 be connected to the same IT framework. So that

3 brings me to the IT interoperability, as well.

4   Now the next is the infrastructure level,

5 specifically at the power systems level. Do we

6 need to go back to the folks who are in the power

7 systems field and talk to them about, you know, I

8 mean, I was reading some very interesting

9 documents on the flight and technical documents,

10 and I saw that we're talking about how the

11 existing Grid deals with a fuse box and things

12 like that. Well, we're moving into the Smart

13 Grid age and I think that a lot of that will be

14 software-based controls, software-based

15 Regulations. We talk about communications and

16 software, so do we need to make fundamental

17 changes at the garage level so that it becomes

18 real easy to do this kind of plug and play within

19 a garage? So, you know, I put some marketing

20 slides of my own research projects up there.

21   We got massive publicity -- by the way, I

22 argue that, you know, many of us will be here

23 five, 10 years from now, you know, and I think is

24 an amazing crowd here, I think all the parties

25 are here -- I would say the most relevant parties

1 are here, and I think that we have to

2 collectively figure out how we can get from where

3 we are to this $99.00 or $100.00 charging

4 station, a smart charging station of the future.

5 So again, in a nutshell, I think we are still in

6 the early stages of this field, you know, and I

7 think we have to have some room for innovation,

8 and I like OCPP, and I support OCPP, and I

9 support Open ADR for the Demand Response, I

10 support more and more standards. I think that

11 the more technology that we have now that we can

12 bring to the table, I think things like OCPP can

13 be studied further and we can add more things,

14 but I think we have opportunity to innovate. So

15 I encourage CEC to focus on your research

16 technology and innovation and demonstration.

17 Thank you very much. [Applause]

18   MS. BAROODY: Thank you, Rajit. Okay,

19 next up is David Peterson. David is West Coast

20 Project Manager for Electric Vehicles. Welcome.

21   MR. PETERSON: Well, Rajit, you're working

22 on some amazing things, but I still can't charge

23 on Level 2 at my apartment. What's going on?

24   PROFESSOR GADH: I'll fix it.

25   MR. PETERSON: Please! I just signed a

1 new lease. So thank you to the CEC, ARB, the

2 Governor's Office for inviting Nissan. Again,

3 I'm David Peterson. I manage the Western U.S.

4 for Infrastructure Development for Nissan, among

5 other things.

6   What I'd like to give you a sense of today

7 is how Nissan is thinking about EVSE

8 interoperability. First of all, I'd like to tell

9 you what we're doing in the infrastructure space,

10 get into some of the details of how we perceive

11 the driver experience, and what we see as being

12 important for EVSEs, and then leave you with a

13 few thoughts.

14   So Nissan is taking a three-pronged

15 approach to infrastructure development; we're

16 focused on dealer charging, community charging,

17 and workplace charging. All of this is, of

18 course, with the objective of increasing range

19 confidence in EV drivers, we're focused on

20 driving within the region, and so we've announced

21 that we're going to be installing 100 DC Fast

22 Chargers at dealerships throughout the United

23 States. We are working on achieving the

24 objective of hitting more than 600 DC Fast

25 Chargers in the public arena throughout the

1   United States, today I think we're a little bit

2   over 300, and workplace charging where, of

3   course, these are all a mix of Level 2 and DC

4   Fast Charging, but seriously workplace fast

5   charging for increasing range confidence and, of

6   course, for providing charging needs for those

7   that need it on long commutes.

8   And so Nissan is thinking very

9   holistically about interoperability. Certainly

10 many of the things that Rajit talked about show

11 up in the Cloud, as well as below in terms of the

12 physical connections, the direct connections

13 between these three -- well, at least the direct

14 connections between the vehicle, the EVSE, and

15 thinking about the different stakeholder needs on

16 either side of that EVSE, really, the driver and

17 anyone who has any sort of, I guess, role in

18 managing, hosting, operating that EVSE.

19   But of course, we're looking at Cloud-

20 based connectivity. We have our own Telematic

21 system, Nissan's Car Wings, and how that

22 interacts with all sorts of third party systems,

23 either the energy management systems, or the back

24 ends of different EVSPs.

25   But of course, today our immediate focus,

 1 and we think our focus for the near term is going

 2 to be on focusing on these direct connections

 3 between the driver, the charging station, and

 4 thinking about the stakeholder needs on either

 5 side of that charger.

 6   And so in terms of the driving experience,

 7 we're focused on a seamless and convenient

 8 charging experience for our drivers. Today, many

 9 have to carry multiple RFID cards to access

10 charging stations, of course, I mean, that's

11 already been brought up so I won't dwell on it.

12 But the other thing that we're focused on is

13 truly a low cost solution, rather having minimal

14 cost impact on drivers. We see this as

15 imperative because it needs to be competitive

16 with what refueling costs are today and we

17 certainly are in the early market stages and do

18 not want to provide any hindrance to market

19 growth.

20   Some of the benefits we see of

21 interoperability are that we expect to see

22 increased competition among EVSPs and we hope

23 that this leads to an improved product offering

24 and hopefully lower pricing, with the objective

25 of attracting and retaining drivers for EVSPs

1   because, if you think about it, if you take an

2   ATM solution or an ATM example, you have one ATM

3   provider that maybe is the most ubiquitous in the

4   marketplace in an area to have ATMs all over the

5   place, but then you have a second ATM provider

6   that is smaller, but then says we won't charge

7   you any fee for accessing all those other ATMs,

8   rather, the large one in the marketplace. Well,

9   you're kind of indifferent between the two and,

10   so, the basis for competition is different and we

11   hope that that actually benefits consumers in the

12   long run.

13   Some of the current issues that we're

14   seeing today, in terms of hardware, we'd like to

15   see more point-of-sale device flexibility. Some

16   hardware is exclusively RFID-based in terms of

17   accessing that charger, some of it is more

18   flexible where it can accommodate credit card

19   swipes. I think we need to think about the

20   stakeholder needs here, the consumer needs, you

21   know, if it's an environment that requires only a

22   credit card transaction, rather a physical credit

23   card point-of-sale device, then I think we should

24   be able to accommodate that. It's still an early

25   market and, if it's a make or break kind of

1 opportunity for a site host, and they don't go

2 with that hardware simply because it doesn't have

3 a credit card point-of-sale device on it, then

4 that's unfortunate, I think, for the

5 manufacturer, and unfortunate for the market. I

6 think we need to think about the flexibility

7 needed for various stakeholders.

8   Another interesting issue that we've seen

9 in the marketplace is the issue of new market

10 entrance among EVSPs. In many cases, if you

11 think about our objective of having a seamless

12 driving experience, if 90 percent of a market is

13 dominated by one EVSP, should that next charger

14 be on that EVSP's network? Well, you would say

15 yes if you were thinking about having a seamless

16 driving experience, but in many cases -- and this

17 goes back to, so I guess that flexibility we're

18 talking about with hardware, but new market

19 entrance, the hardware requirements, rather, for

20 accessing the charger can be different from the

21 market incumbents. And that's where we really

22 need to see interoperability. And until that's

23 the case, we really can't be supporting new

24 market entrants because it just takes away, it

25 detracts from the objective of a seamless

1 charging experience.

2   In terms of managing the charging station,

3 obviously our objectives here are to provide

4 flexibility for the site host to meet ever-

5 changing market conditions and stakeholder needs

6 and we would be pleased to see increased product

7 diversity. Today we do have some vertically

8 integrated options in terms of software and

9 hardware integration, and we do have an

10 increasingly greater mix of interchangeable

11 hardware with ESVP networks, most of these are

12 OCPP. And again, these benefits, of course, from

13 the station host perspective or owner, or

14 operator perspective, low switching costs -- as I

15 think Brett had mentioned -- is critical. And

16 this is actually a typo, it should be

17 "competition to attract and retain EVSE site

18 hosts/owners/operators," which can lead to

19 improved product offering and lower consumer

20 prices simply because of the competition to want

21 to have those customers on your network.

22   Some of the issues that we're seeing is,

23 if you are a site host with multiple EVSPs, what

24 do you do? Do you stay with one? Do you have

25 multiple? How do you accommodate that? And that

1   is something we're seeing a lot in the workplace

2   scenario. It's great business for those

3   workplaces that want to continue to provide

4   anyway services that are on a single network, but

5   many hardware options are not going to be on that

6   network, so how can we accommodate that

7   stakeholder's needs, right, that workplace's

8   needs, and it could be any stakeholder, I'm using

9   the example of the workplace.

10   And of course, we have to think about the

11   incremental cost of upgrading those charging

12   stations that are already installed. What is it

13   going to cost to comply with Standard A, B, or C

14   for interoperability? And I think who bears

15   those costs, and that's another consideration.

16   And certainly our objective is that the driver

17   will not bear any of the cost of these upgrades,

18   but I think that's an open question about how

19   those costs are addressed.

20   And so some final thoughts here and

21   perhaps some thoughts for how the CEC can start

22   thinking about interoperability, which is how we

23   think of interoperability, which is we need to

24   think about the customer, so we support customer-

25   centric products and services, we're thinking

1   about low cost solutions, and we are evaluating

2   any and all options for interoperability, we're

3   not trying to lock ourselves into a solution that

4   precludes us from providing the best charging

5   experience for our drivers down the road. I

6   mean, the market is quickly developing and

7   changing and stakeholder needs are continuously

8   evolving, so we need to keep that in mind.

9   So with that, I look forward to an

10 interesting discussion today, and thank you.

11 [Applause]

12   MS. BAROODY: Thank you, David. All our

13 speakers have done a great job in this first

14 session to keep their comments to 10 minutes; in

15 fact, we're ahead of schedule and if it's okay

16 with you, Elise, we do have another speaker who

17 has a hip pocket presentation ready to go in case

18 there is time.

19   MS. KEDDIE: Okay. I do encourage after

20 that, yeah, if that presentation is available we

21 can --

22   MS. BAROODY: Jordan Ramer, is he here?

23 Oh, Jordan, are you ready?

24   MS. KEDDIE: Okay, bring it up and we'll --

25   MS. BAROODY: Well, the presentation is in

1   the package, so people could refer --

2   MS. KEDDIE: Is it in the packet?

3   MS. BAROODY: Well, actually that was a

4   docket item.

5   MR. RAMER: Plus I think pretty much

6   everything in it was said.

7   MS. BAROODY: So you don't need to --

8   okay, all right. I just thought I'd give you an

9   opportunity. Okay, great. Thank you.

10   MS. KEDDIE: I assume you want the

11   speakers from this first section to come and sit

12   here?

13   MS. BAROODY: Oh, that would be a good

14   idea.

15   MS. KEDDIE: That would be the easiest way

16   to handle questions.

17   MS. BAROODY: Sounds great. So if the

18   speakers would come up and then we'll ask

19   questions. Okay, so we have our panelists here

20   and we'd like to take questions from the

21   audience, and I'll hand you the mic when you're

22   ready. Okay, if you could also state your name

23   before you ask the question, that would be great,

24   and who you're asking.

25   MR. HALLIWELL: My name is John Halliwell.

1 I work with EPRI, the Electric Power Research

2 Institute. I have a question for Jason. As a

3 consumer, I find credit cards pretty convenient,

4 and you mentioned they're inefficient. I was

5 just wondering if you would elaborate on that,

6 what is sort of the back story, what makes it

7 inefficient from the EVSP perspective?

8   MR. WOLF: Great question. I know a lot

9 of people that prefer to use credit cards, I know

10 a lot of people that prefer to use apps and QR

11 codes, I know a lot of people that can't even do

12 that mobile stuff, I know we're all kind of hyped

13 about the mobile phone. I'm not against any kind

14 of payment method, that's the first thing that's

15 important, I'm just saying when you talk about

16 inefficiency, there should be an option and

17 someone that has multiple cards and multiple, I

18 think you should ask the question how many people

19 today are using credit card versus RFID, I think

20 the answer will be a lot more RFID. Now, it

21 doesn't mean that will be the case, it might be

22 the right solution for a lot of people to use

23 credit cards. But my point is that from a cost

24 perspective, the fact that we're clearing all the

25 transactions is going to be cheaper for the

1   industry and more money stays in all the

2   stakeholders' hands than individual credit card

3   swipes. That's what I'm saying.

4   MR. LOWENTHAL: Could I weigh in on that a

5   little bit, too?

6   MS. BAROODY: Absolutely.

7   MR. LOWENTHAL: So I think something to

8   keep in mind, we are a subscriberless system;

9   Chargepoint doesn't use subscriptions. All of

10 our transactions go through credit cards, so it's

11 sort of a matter of how you get there from here.

12 Our drivers prefer the sort of FasTrak model

13 where it's lower cost to process the transactions

14 because the cost of electricity for most times

15 you plug in is 50 cents. The cost that I have to

16 pay VISA is 25 cents. So just kind of minimizing

17 that and charging the consumer only one out of 10

18 times, or one out of 20 times, makes a lot of

19 sense on these tiny transactions. We do support

20 people who want to use their cell phone instead

21 and start and stop sessions with cell phones,

22 that's perfectly okay with us, I think that's

23 probably the way it's going to go. We support

24 things like Google Wallet, and there just hasn't

25 been much action there. The credit card reader

1 itself has some problems, so when you're talking

2 about swiping, there's a pretty significant

3 maintenance issue with credit card swipers and a

4 very significant security issue. And it's a

5 little different than the gas pump because these

6 things are in like weird places out in the woods

7 or behind parking lots, so there are some issues

8 with swiping. We have no issues with credit

9 cards, ultimately every dollar that comes in

10 comes from a credit card.

11   MS. BAROODY: Okay, great. Other

12 questions from the audience? Right over there,

13 Rick Teebay.

14   MR. TEEBAY: Hi, Richard. I'm Rick Teebay

15 with L.A. County. In your presentation, you said

16 OCPP is a station owner benefit. Can you expand

17 on that? Why is it a station owner benefit

18 versus a system that's non-OCPP?

19   MR. LOWENTHAL: Sure. What's good about

20 OCPP is you can diversify your hardware. So we

21 have, I think, seven vendors that put hardware

22 onto the Chargepoint network, which gives the

23 station owner a lot of choices in what hardware,

24 how much they want to pay, what they'll look

25 like, and all that. So that's their benefit is

1   it's more competitive. All these open network

2   standards lead to more competition which benefits

3   our customer. Our customer is the station owner,

4   and now they have choices, so I think that's

5   good. I think another benefit is that they can

6   choose in different environments different kinds

7   of things; for instance, we see DC chargers on

8   our network, we see Level 1 chargers on our

9   network, we see Level 2 chargers on our network,

10   so all of that kind of interoperability, the

11   choice for our customers. We think of our

12   customers as the site owner, the owner of the

13   EVSE. So it just gives more choice.

14   MR. HAUSER: I just want to ask a follow-

15   up question. You said you guys are connected to

16   seven different EVSE manufacturers; are you

17   connected to those using OCPP?

18   MR. LOWENTHAL: Some.

19   MR. HAUSER: Okay.

20   MS. BAROODY: Okay, Jim McKinney, Energy

21   Commission.

22   MR. MCKINNEY: Good morning. Jim McKinney

23   with the Energy Commission. First, I just want

24   to thank the panelists for this very very

25   thoughtful insightful presentation, it's really a

1 dynamite panel. What other data do we have

2 purely from the consumer perspective? I hear

3 lots of different points of view from you very

4 important people, but do we have enough data yet

5 from consumers, actual users of the cars in these

6 various ways to pay for the electricity? I don't

7 know if there are academic studies or things

8 coming out of the vehicle side of this, but I

9 think David alluded to that a little bit and I

10 know, Rajit, as an academic you may be aware of

11 that. But I think, you know, for us as

12 Government, we'd really like to know more about

13 the end users here.

14   MR. HAUSER: I would say that J.R. DeShazo

15 from the Luskin Center, your former employer, has

16 done a lot of studies on pricing and pricing

17 payment preferences with respect to the consumer.

18 I don't have all the specific information with

19 me, but I would be happy to get it for you and

20 connect you with J.R., he's done a lot of work in

21 that area.

22   MR. LOWENTHAL: I can give you just a

23 little bit from transactions in our network. So

24 we have 40,000 users of our network now, 12,000

25 stations, and so we're gathering a fair amount of

1 data. And 97 percent of our transactions now are

2 using RFID tags. They have the option of using

3 the wireless credit cards, you know, the various

4 credit cards that have RFID built in, and they

5 have the option of using their cell phone, they

6 have the option of calling our support center to

7 start sessions, about 97 percent remain using

8 RFID. It's somewhat surprising because they

9 complain about it until they use it and swiping

10 the card is actually fairly convenient, so,

11 anyway, that's just a statistic from our network.

12   MR. WOLF: On our network -- no, sorry,

13 not "our" -- Better Place Network in Hawaii had

14 almost 1,000 users at the time that we sold it to

15 OpConnect, and we did a survey to ask them what

16 are their top issues with the network. The

17 number one issue, which frankly Better Place

18 didn't do, which was to display the pricing on

19 the stations. The number two issue that they

20 said is that there are other charging stations in

21 Hawaii, like Aerovironment and Chargepoint, they

22 wanted interoperability. And those were the top

23 two key issues and that's why we started

24 discussing this user roaming, not

25 interoperability, but the roaming ability.

1   PROFESSOR GADH: So, I mean, there have

2   been studies done including the one by GR and

3   UCLA and other places, but I still think that --

4   I don't think we have a lot of analytics on the

5   data that we have gathered, and I think that as

6   -- and this is one of the reasons why I think

7   that, you know, we have to do some more studies

8   -- as we turn the scale up on the number of

9   charging stations in California, and I think in

10   California we are probably ahead of most of the

11   states in the country in terms of the number of

12   EVSEs, and these guys are experts at that, but I

13   think more studies are needed specifically on

14   issues like, you know, when the user goes into a

15   garage, I mean, we talk to users and do you

16   prefer to swipe an RFID tag? Do you prefer to

17   use the mobile app? Do you prefer none of the

18   above? Do you prefer that your card directly

19   talks to the charging station? Now, we have the

20   SAG 1772 plug and then we have some data

21   protocols, but are those data protocols

22   sufficient? I think more can be done. So I

23   think that the input from some of the consumers

24   has let me to believe that I think that the

25   technology still has a way to go.

1   MR. LANGTON: I agree. Just to build on

2   that a little bit, I mean, I think -- I mean,

3   frankly speaking, I'll just be direct here, I

4   think the problems of RFID in the U.S. is based

5   on the lack of choices with the payment methods,

6   so RFID is the de facto method, so that's what

7   you use -- which is okay, I mean, it suits the

8   needs of many people, but there are lots of

9   options out there. So I would build on what

10   Rajit said, I think there's still a wide range of

11   options that can be made available to the

12   consumer at minimal or no cost to offer those,

13   let's say, true roaming experiences. A direct

14   credit card reader is one example. In Europe,

15   obviously credit cards are quite prevalent, but

16   it's also a very cash focused society and also

17   now direct payment by phone, so we're working on

18   a number of projects. Again, this is not AD

19   specific, this is our customers are implementing

20   solutions that would be pay by SMS, pay by phone,

21   a prepaid card so you go into a gas station,

22   let's say, that the charger is co-located at a

23   gas station, you go into the gas station and buy

24   a prepaid card, scratch off the card, and have a

25   number, and type that number in your phone, and

1   that accesses the charger remotely. So there's a

2   whole host of other telecom-based models, in

3   addition to garages, integrated payment with the

4   parking garage system that are still really

5   working across Europe, too. And I think, I mean,

6   as far as data I don't have a specific dataset to

7   provide you, but I can provide you more details

8   on those, as well.

9   MS. BAROODY: Great. Thank you. It looks

10 like we have another question -- oh, I think

11 we'll go here first. Oh, first over there.

12   MR. HAWKINS: Dave Hawkins, kn-Grid. We

13 have little microchips we put in dogs, so we can

14 always recover a dog; what's wrong with getting a

15 little microchip in each vehicle and, whether I'm

16 driving the vehicle and need a charger, or my

17 wife, or the kids, or whatever, it can be charged

18 as long as, you know, no one stole the car. So

19 we can always put up an alert if someone steals

20 the car and it says you can't charge it anymore,

21 but what's wrong with getting a little microchip

22 in the car?

23   PROFESSOR GADH: So three years ago my lab

24 demonstrated that concept -- Rick, I think you

25 may have seen that demonstration where the car

1 drove in, there was an RFID meter on the ground,

2 and it read the tag directly to the transaction.

3 So technically it's feasible, but I'll tell you,

4 the cost of putting the readers in the parking

5 garage under the floor is very expensive.

6   MR. LOWENTHAL: If I could weigh in, too.

7 SA is developing a standard, they're nearly

8 completed on a standard where the car can

9 identify to the EVSE its vehicle I.D. and its

10 state of charge and all that, so the technology

11 is coming along there; we still don't know

12 exactly how the market is going to go, but there

13 are very active discussions and their standards

14 are being established for the car to be able to

15 identify itself.

16   MR. PETERSON: Yeah, that's true. And

17 we're looking at that as well from Nissan's

18 perspective, but again, I think that's a solution

19 that's down the road. I don't think that's

20 something that supports the drivers today.

21   MR. LOWENTHAL: I like the down the road

22 thing.

23   MR. PETERSON: No pun intended. But

24 honestly, today, I mean, we have thousands of

25 chargers out there and we've got thousands of

1 drivers out there, and they need to be able to

2 access all these chargers; so, yes, I think we

3 should be looking towards more innovative

4 solutions, but I think we need to find low cost

5 solutions that meet the need of the drivers

6 today.

7   MS. BAROODY: Okay, great. Thanks. Let's

8 go to Matt, and then we'll go back to Rick, and

9 then to Paul.

10   MR. ZEREGA: Thanks. I agree, it's a

11 great panel today, so thanks, quite a broad array

12 of perspectives and this is great. I'd like to

13 go back to this question about efficiency of

14 credit cards. It's pretty well established what

15 interchange fees are and what it costs to buy a

16 terminal and that kind of thing, so those costs

17 are very well known. I think what's not well

18 known today is what does it cost to use this

19 concept of I think what ELAD refers to on their

20 website as the central system. For those who

21 know out there, what are the costs today to those

22 using this concept of the OCPP central system?

23 What are the transaction costs as a percentage

24 basis and fixed fee per transaction?

25   MR. WOLF: I think you mean the role

1 meaning clearing, not so much the OCPP network

2 side. You mean the ability to take Network A's

3 whatever access phone, tag, whatever, and use

4 Network B's charger, what are the fees for doing

5 that transaction across networks?

6   MR. ZEREGA: More from the EVSE site

7 owner/site operator's perspective. What are the

8 costs to use the OCPP central system or back

9 office?

10   MR. WOLF: Okay, I just wanted to clarify

11 the question.

12   MR. ZEREGA: Sure.

13   MR. LANGTON: So let me weigh in here,

14 Brett and then -- so let me try to answer your

15 question. So let's put it in the context of

16 ABB's business model, for example. So we have a

17 server, a server farm, basically. We rent out

18 space for a server that has our OCPP client and

19 where, you know, the end solution of all the

20 API's for ABB sits; that communicates via the

21 Cloud to all of our chargers, so all the chargers

22 have a 3G modem in there. For us, that's just

23 the cost of doing business. So for ABB there's

24 no per transaction fee. So the modem is included

25 with the price of the equipment, including the

1 ongoing 3G connection, and how we monetize that,

2 frankly we monetize that through service level

3 agreements on maintenance and connect the

4 services for the DC Fast Charger, so it's a

5 little harder with the AC charger because it's

6 much lower cost and can bear lower maintenance

7 fees. But we do have bi-leveraging, up time, and

8 things like that. So then, where does the

9 transaction piece come into play? So there's no

10 transaction part to that, so a company like

11 Greenlots would come in and provide the

12 transaction services for that group of chargers,

13 and then they would be able to set the

14 transaction fees themselves. So that's kind of

15 from a backend hardware perspective we're not

16 passing any of that on to the consumer directly.

17 We use it to leverage our network connectivity

18 and then let the business to consumer focus

19 companies, you know, have a low cost solution to

20 do their transactions on top of.

21   MS. BAROODY: Go ahead.

22   MR. HAUSER: I think that's correct. Said

23 another way, there's no fee for using OCPP

24 itself, right? That's a free lights and bolt

25 technology. And then, to Cal's point, whether

1 it's Blink, Chargepoint, Greenlots, EV Connect,

2 whoever it is, they're going to set their own

3 pricing policies and what they're going to charge

4 the consumer. The good thing about OCPP is you

5 know that if you don't like the pricing and the

6 transaction fees that you're getting from one

7 service provider, then you can easily make a

8 switch keeping the same charge station intact, so

9 ultimately the hope is that, because you have

10 that flexibility, those network management

11 solution providers will actually be very

12 competitive in their features and their pricing,

13 and then that will help to push prices down as

14 innovation becomes important in order to maintain

15 your customer base.

16   MR. LOWENTHAL: Now I have to weigh in.

17 We have to keep balance. Most of the fees are

18 set by our station owners, so the price for

19 charging, the price per kilowatt hour, the price

20 per time, all of that is set by our station

21 owners. We don't do that. We collect a small

22 percentage of fees when they charge the consumer

23 for charging the car because we have to clear

24 with VISA or whoever, and we have to cover our

25 cost of doing that. But the lion share is set

1 by, you know, if I charge in Los Gatos now, it's

2 $3.00 a session, and if I charge in Cupertino,

3 it's $1.50 an hour; all of that is set by our

4 hosts.

5   MR. HAUSER: Right, but just to clarify,

6 Chargepoint might be taking a percentage for

7 whatever business they need to do, so the

8 clearing, but another company, a network

9 management solution, might not be charging

10 anything. The site host does have the ability to

11 set the pricing, but the cost that that consumer

12 is being charged for using that service varies

13 depending on the network service provider they're

14 using.

15   MS. BAROODY: Okay, thanks. Rick, I think

16 you have another question, and then we'll go to

17 Paul here.

18   MR. TEEBAY: I'm thinking about the

19 roaming charge and I know in Europe, Cal, I don't

20 believe they have roaming charges. And I'm just

21 -- the number I've seen is $2.00 for a roaming

22 charge for a session and I'm thinking, you know,

23 it would probably be cheaper to use a contactless

24 credit card and pay the transaction fee than it

25 would be for me to pay the $2.00 roaming fee.

1   Any comments on that?

2   MR. WOLF: Yeah, no, it's not $2.00, maybe

3   you saw $2.00 which is the average price of a

4   roaming session today. Out of the hundreds of

5   thousands of roaming sessions, the average price

6   a consumer pays today is $2.00. Out of that

7   $2.00, basically it's the site host's decision if

8   they want to swallow the fee to clear an entity,

9   or they can pass it on to the driver, it's the

10 same as a shop with a credit card, they can say,

11 "I don't accept credit cards because I don't want

12 to pay the three or four percent," or whatever.

13 But that $2.00 refers to the total cost today on

14 average roaming fees. Out of that, if you're

15 going -- I can talk about Collaboratev, people

16 know the credit card gateways and interchange and

17 all those fees that add up -- Collaboratev is

18 charging $.25 on that transaction plus seven

19 percent of a transaction. So a lot of these

20 roaming charges are free, but there's still a

21 service provided by Collaboratev and we charge a

22 base price of $.25 per charge, so there's nothing

23 close to $2.00 anywhere for a roaming charge fee.

24   MS. BAROODY: Okay, thanks. Let's go to

25 Paul.

1   MR. STITH: Paul Stith, Plug in America.

2   And actually, Richard, it's going to be your

3   question today.

4   MR. LOWENTHAL: Great.

5   MR. STITH: So I am a technologist, so I

6   know all the back office kinds of goodies and

7   OC's this and that's, but my question is the

8   consumer side. I didn't know you had any OCPP

9   compatible stations. Are there any in the

10   California market? And then the second follow-on

11   to it is, as a consumer when I go to charge at

12   that station, does it look any different to the

13   consumer to be at a proprietary version station

14   versus an OCPP-enabled one?

15   MR. LOWENTHAL: So we don't have them in

16   California yet, we don't have it available to us

17   yet at a UL approved OCPP compatible station; in

18   Europe we have OCPP stations. Part of the issue

19   is the current level of OCPP 1.2 doesn't support

20   all the services that we like to offer drivers,

21   so that you will see a difference. You know, you

22   can't do a payment system at the moment with the

23   released version of OCPP; so, yes, you may see

24   some differences in functionality. You know, we

25   started shipping network stations in 2008, OCPP

1 is catching up quickly, and I think we'll see

2 more functionality shift that way and us to be

3 able to support all services on OCPP stations.

4 So we embrace that, we're just waiting for

5 stations that are both UL approved and have the

6 breadth of functionality that consumers need.

7   MR. STITH: And then one more that goes

8 more to the nuts and bolts and technology, and

9 anyone to answer, the different between OCPP as a

10 Cloud technology, or device technology when

11 you're talking of communication? Anyone want to

12 take on the differences about how those things

13 look to the consumer?

14   MR. LOWENTHAL: I think the discussion,

15 Paul, so far -- and happy if other people want to

16 weigh in -- have to do with standards and

17 openness, so I think we're less focused right now

18 on the functionality you get, but actually

19 spreading that functionality to more places and

20 creating more flexibility, so at least we see

21 OCPP as a clear open standard to hardware and

22 less about its implications on the functionality,

23 except as where its current development might

24 limit the functionality, which we have now today

25 between 1.2 and 2.0.

1   PROFESSOR GADH: I just want to add one

2   more little -- since the discussion about

3   standards. There are other standards also that

4   are, for example, Smart Energy Profile 1.0, and

5   so basically you can convey a lot of energy

6   information and, you know, SEP 1.0 -- working on

7   top of the previous ITRIP 15.4 protocol, and now

8   you have SEP 2.0 that works on WiFi, it's just --

9   it's application of a protocol, so there are a

10   lot of other standards that are already out there

11   and if you want to support standards, you should

12   look at, for example, SEP 2.0 also, I think.

13   MR. STITH: Thank you.

14   MR. CHERKAOUI: My name is Abdellah

15   Cherkaoui. I would like to just point out maybe

16   really a bit of comment. I know your Europe

17   pretty well, I've been working there and I

18   represent Hubject, which is a company doing

19   exactly the same thing Collaboratev is doing, but

20   in Europe. Just about OCPP, I hear a bunch of

21   different things and I would like to clarify just

22   one single point, is that OCPP is just a

23   language, it is just a protocol, a communication

24   protocol between hardware and software and it

25   allows the exchange of data. So the various

1 companies provide software, various companies

2 provide hardware, and it just happens to be one

3 of the first ones that was open source. I hear a

4 lot of things about standards, Standards 2.0,

5 Tech Time, I don't think there is any single

6 standards around OCPP except that it is openly

7 available today, and it is being used and

8 provided into standard, but here in the U.S. and

9 in Europe, so that it can be managed. We heard

10 about stranded assets, and a standard can be a

11 stranded asset, as well, if it's not managed in a

12 sustainable manner. And last, about costs;

13 different companies have to recoup their costs in

14 different ways, but ultimately, just to bring

15 back the last point about efficiency, if we want

16 to get drivers to adopt and to accelerate the

17 uptick of driving, it has to focus on the

18 convenience to EV drivers, that's what they

19 demand mostly, is that they are able to access,

20 to know where EV charging is available, and

21 according to their preference, the preference of

22 their car, the preference of payment, and most

23 importantly, the preference of where they park.

24   MS. BAROODY: Okay, thank you. All great

25 questions. Anybody else? We have time for maybe

1   one or two more. Okay, go ahead.

2   MR. BOYCE: David, you kind of talked

3   about point of sale as one of the metrics you had

4   up there, and one of the things I think about is

5   how to make this stuff as friendly and easy to

6   customers. And one of the comments I've had

7   anecdotally from a lot of our customers is, in

8   reality, a lot more interest in point of sale and

9   in things like, "If I have to go out and get an

10 RFID card, that can be another barrier." And you

11 know, using the same credit card systems that

12 they're used to, at least in my mind, and I'm

13 making more of a comment here, is much more

14 familiar to the average customer, not your

15 earlier adopters. And how much work have you

16 done in trying to make it as easy and convenient

17 to what they already know and can, I'll just say,

18 be comfortable with?

19   MR. PETERSON: Well, I think we're doing a

20 lot. We're working with various suppliers on

21 trying to identify -- basically build in the

22 flexibility that I think we need. And you speak

23 of the average driver; I mean, I think what we're

24 looking at is, you know, very context-based

25 situations. For example, you go to a work place

1   and workplace charging is one of our big

2   objectives this fiscal year for us, and that work

3   place has a closed network, and it has a bunch of

4   chargers already on a certain network. It's the

5   employer there that's controlling that situation.

6   I think if you're talking about general public

7   charging, I think we have to think about what

8   supports the business models that are in that

9   public realm. For example, if it's an amenity

10   model that's going to be supported, right, where

11   charging is being supported for free, no cost to

12   consumers, but access is important, so being able

13   to recognize that it's the customer that is going

14   to be a customer of Walgreens or something like

15   that. I think it's very nuanced. I think it's

16   easy to say, yes, we want credit card swipes

17   everywhere, and I think we have to look at the

18   various stakeholder needs that would maximize

19   benefits for everybody. But certainly for what

20   you're considering, average, I mean, yes, I think

21   everyone uses a credit card, it's easy, but let's

22   look at it at a more nuanced level and find the

23   right solutions that work for everyone.

24   MR. LOWENTHAL: Could I weigh in on this?

25   MS. BAROODY: Please.

1   MR. LOWENTHAL: So I think there are two

2 aspects to that, Bill -- and certainly we've had

3 wonderful debates inside of our company about

4 magnetic stripe readers -- one is there is a cost

5 value trade-off and the consumer also doesn't

6 like to pay more, so with a point of sale device

7 that maybe has $250.00 worth of revenue a year,

8 you have a different economic than you do with a

9 gas pump that has $250.00 an hour, so to the

10 extent you tax him for hardware that you've put

11 on there, the consumer doesn't like that either.

12 So we have to trade off a little bit of

13 functionality versus cost in all of these things.

14 But the other thing is the credit card

15 transaction is always anonymous, so if they want

16 reservation, or if they want to know when their

17 car has been unplugged, or if they want to know

18 when their car is fully charged, then they don't

19 want anonymity. And it brings up a broader

20 topic: charging cars is different than fueling

21 them with gasoline; because it takes so long, it

22 has a more intimate relationship for the driver,

23 the driver is more connected to his car when it's

24 fueling, rather than standing next to it for 90

25 seconds as he pumps gas in, and so things like

1 reservations, things like notifications of when

2 it's busy. We're starting to do a thing now

3 where we notify -- in congested workplaces, we

4 notify the next driver that a station is

5 available to improve the asset utilization at a

6 workplace, right? This guy is finished, the next

7 guy wants to charge there, so we have to know

8 that guy so we can tell him, "Hey, there's a

9 station now available." So it's a new

10 functionality we're giving that, if you go to the

11 anonymous transaction, which is what the credit

12 card swipe is, you can't do those kind of things.

13   MS. BAROODY: Okay, great. Thank you. I

14 think we'll hold any questions until a little bit

15 later. So we're going to move on now to our next

16 group of speakers. Thank you very much for

17 answering all those questions. [Applause]

18   So is Mike Tinskey here? Oh, there he is.

19 We have Mike Tinskey here. He is Director of

20 Global Vehicle Electrification and Infrastructure

21 with Ford Motor Company. Welcome.

22   MR. TINSKEY: Thank you very much for

23 having me. All right, thank you very much, Air

24 Resources Board, Energy Commission, Governor's

25 Office, for having Ford here today. Maybe I'll

1 start off with a funny story, a true story, from

2 last week on interoperability. Our company

3 helped along with other companies, sponsored a

4 retrofit of low cost lighting, LED lighting, and

5 charge stations at our local library, Dearborn

6 Library in Michigan. And as part of the ceremony

7 which was last Friday, I asked one of my team to

8 go take our vehicle down and check out the charge

9 station, make sure it works. And so he drives

10 down -- just to paint a picture, this is a turn

11 of the Century beautiful building, 7:00 a.m., he

12 drives in, the charge station freshly installed,

13 nobody around, plugs in the vehicle, and sure

14 enough he plugs it in and he hears somebody say,

15 "Nice car. Does it work?" And there's nobody

16 around this library. Once again, the question

17 comes back, "Does it work?" And so he couldn't

18 find anybody, he didn't even know where it was

19 coming from, so he drove back to the office which

20 was only a half a mile away, and is just baffled,

21 and he said, "Somebody was asking me how it

22 worked and there was nobody around." So he

23 thinks there's some higher power that's asking

24 about interoperability. The story revealed

25 itself on Friday, the electrician came up to me

1 during the event and said, "I was up in a bucket

2 truck and installing the lights, and your

3 engineer didn't say anything back to me." And I

4 said, "Well, I think you had a bigger impact on

5 him than you think." So anyways, a story on

6 interoperability. Anyway, thanks for having me.

7 Mike Tinskey from Ford Motor Company.

8   Just to give you a flavor of our products,

9 we do have six, there's five shown here, we have

10 a Lincoln MKZ that we all call electrified

11 vehicles, three of them are plug-ins, three of

12 them are hybrids. The reason why we always show

13 them all is because our hybrids are very similar

14 to our plug-in hybrids. In fact, the battery is

15 about the only major difference, so every hybrid

16 that we sell helps our cost equation for our

17 plug-in hybrids, so the C-MAX Energi, which is

18 the plug-in is very similar to the C-MAX hybrid,

19 etc. So we always like to ground everybody that

20 we're really focused on cost and this is one way

21 to get cost out.

22   And we're doing well. The whole industry

23 is doing well. I know it was mentioned earlier

24 about, you know, in terms of we have to celebrate

25 our successes. And I think that this is a proved

1 point. So what we like to say, what took the

2 first eight years took two percent of market

3 share only took 12 months to get the second two

4 percent market share. So in October of 2011, we

5 hit two percent hybrid sales, and the industry

6 hit the same milestone. And then in October of

7 2012, the industry hit just about four percent.

8 So once again we're seeing some good progress.

9   But to cut right to -- and once again,

10 thank you for asking for our opinion, this is our

11 point of view -- we see the growth, it's a key

12 part of our long term strategy. We do think

13 there's challenges that currently exist in the

14 fast charging protocols, hardware inter-

15 operability, and dynamic data. But this is one

16 thing that I was really happy to hear on the

17 panel they mentioned today is that we really need

18 to think about cost.

19   As you probably know, Ford is bullish in

20 the near term on plug-in hybrids, and when we

21 talk about all the frameworks we're talking about

22 today, think about that customer that's driving a

23 plug-in hybrid and the decisions they have to

24 make when they charge. They could charge at a

25 fuel pump, or they could charge at a charge

1 station, and I think it's upon us and the people

2 in this room to really think about them as a real

3 potential customer and keep the cost down so they

4 do charge using the charge station, rather than

5 use more Petrol. So we tend to focus on battery

6 electrics when we have these conversations, but I

7 encourage us all to also think about plug-in

8 hybrids as another potential customer.

9   So what do we advocate? Our list, first,

10 is we do support public infrastructure. We are

11 one of the companies that is supporting the DC

12 Combo fast charge arrangement, along with seven

13 other automotive OEMs, and we do encourage all

14 installation or infrastructure to be connected.

15 I know that that's a bit of a contentious item,

16 but we know that all the things we're talking

17 about in this room, one of the real requirements

18 is that we have to have that network capability

19 so that we can have more interoperability.

20   Number two is workplace charging

21 solutions. For us, this one is really important

22 because we're a big fleet company, we sell about

23 13 percent of our products to fleet, and when you

24 sell a plug-in hybrid to a large company, the way

25 to increase the number of electric miles is

1   really to get that second charging event and

2   workplace is a great place to do it.

3   Number three for us is hardware

4   interoperability. We've run into a few snags

5   relative to a charge station not working with our

6   vehicles; it's been more than one manufacturer in

7   terms of EVSE manufacturers. So this one is

8   really important to make sure that any new

9   product that is coming out, both physically works

10   and electronically is compatible with our

11   vehicles. And this is an industry issue, it's

12   not just a Ford issue, it's all product.

13   Number four, we do think that customers

14   are going to need to do -- that we have been

15   getting feedback from our focus groups that

16   customers do want to use multiple networks, and

17   that has been a bit of a challenge. I'm not

18   saying that we need to have full interoperability

19   today. I think, as Cal mentioned, the 454 bill

20   addresses some of the near term options there,

21   but we definitely support it in the long term.

22   Number five is really about this low cost

23   structure, but also how do we communicate -- and

24   I'll show you a graph later -- how do you

25   communicate where those public charge stations

 1   are and their availability, and do it such that

 2   the industry does not bear a lot of cost and

 3   inefficiencies? And I'll tell you more about

 4   that when I show you the graph.

 5   And then finally is the interoperability,

 6   which has been a lot of the conversation we

 7   talked about today, and how do you do roaming and

 8   payments, etc. So that is our prioritized list.

 9   I'll show you a real quick just a little bit of

10   data that's coming off our vehicles.

11   We're selling quite well. The fact that I

12   like to say is that every 10 days Ford customers

13   drive another million all-electric miles, and so

14   right now we're running close to 16 million, this

15   is from a few weeks ago. The five million miles

16   is actually generated from -- it should say zero

17   carbon sources, so it's nuclear plus renewable.

18   So we take the customers' Zip Codes, we find out

19   where they charge, what the energy generation mix

20   looks like, and you can see that there's a good

21   amount of miles that are using no -- generating

22   no greenhouse gases.

23   We're also finding that our drivers are

24   getting smarter at their ability to get more

25   miles of every charge happening, so this is from

1   the day they've activated their vehicle to now,

2   so it's all referenced to experience level, how

3   many of the trips they're getting on pure

4   electric. So you can see there's a trend over

5   time that the longer they own their vehicle, the

6   more miles they're getting out of it

7   electrically. So they could be figuring out how

8   to drive better, they could be charging more

9   often, we're still investigating the opportunity

10 there.

11   On average, about six times a week they're

12 charging, no surprise here. By the way, this is

13 our energy driver, so these are two plug-ins, our

14 C-MAX Energi and our Fusion Energi. And they're

15 charging about six times per week. And you'll

16 see there's an opportunity here because right now

17 they're charging about, well, I didn't show the

18 graph, but 75 percent of their trips are in all-

19 electric mode. Now, that's impressive because

20 three out of every four trips are all-electric.

21 Now, that can be better, workplace charging I

22 think would take that number up, but to get three

23 out of four what we're finding, if I showed you

24 all the data, is that the customers are actually

25 using these plug-in hybrids, so during the week

1 they generally function like a BEV, and then on

2 weekends they're generally functioning like an

3 electric hybrid and they're going to the wine

4 country, or wherever. And so we're seeing

5 opportunity for workplace charging there.

6   To give you a sense of where we're

7 charging, this is a heat map, you can see that

8 this past week our customers charged about 8,300

9 times in California alone.

10   Well, how are they charging? Well, most

11 of them are charging using a regular plug at

12 their home, 70 percent of those customers are

13 doing it that way. We'd like to see that number

14 go up because we think we can get more electric

15 miles the more customers using Level 2.

16   And then maybe just to carve a little

17 deeper into the specific issue I referenced at

18 the beginning, so we have an app called My Ford

19 Mobile and this app allows the customer to map

20 where they want to go and it shows all the charge

21 stations along the way. All of the OEMs, all of

22 the automotive OEMs, are I think facing a similar

23 challenge, that you have these multiple networks

24 and we want to show all of those shared charge

25 stations and we actually want to show all the

1 dynamic data, we want to say is it in use, not in

2 use, etc. And what's happening today, I'll give

3 you the Ford example, we essentially have to take

4 the API from every one of the networks and then

5 incorporate that into My Ford Mobile, roughly

6 about a $50,000 cost to our company per API. So

7 if you take that number and, say there was 12

8 network providers, you can see that every

9 automotive OEM, assuming they have the same cost

10 structure, is bearing those type of costs to

11 integrate those charge stations into their app or

12 into their vehicle.

13   So what we propose is to have an

14 aggregator. Now, in our case right now, we're

15 using an aggregator that exists today that's

16 called PlugShare, they're a California based

17 company. But essentially what they helped us do

18 is they bring in all that information to the one

19 spot and then we only have to integrate one API

20 into our vehicle.

21   Now, you could change who this aggregator

22 is, you can change the framework a bit, but we

23 really think it's important because then all of

24 the automotive OEMs only have to do that once and

25 have a standard way of interfacing with all the

1   charge stations. So we think this is an

2   important framework as we think through some of

3   these interoperability challenges.

4   So I'll just close with the same points,

5   it's the same slide that I showed you earlier, I

6   just think I'll go back to the main point, two

7   points, one is cost is key both in terms of

8   product and interoperability, and don't forget

9   about the plug-in customers as being potential

10   charge station customers because I think they are

11   definitely out there in volume. So thank you

12   very much for having me. [Applause]

13   MS. BAROODY: Thank you, Mike. Appreciate

14   that. Next up we have Matt Zerega with SDG&E.

15   Welcome, Matt.

16   MR. ZEREGA: Again, Matt Zerega. Just a

17   little bit about me; I've been an energy

18   professional for about 11 years. I am a former

19   IT professional. I like to call myself a

20   recovering IT professional. So I have an energy

21   view on things, I have a technical view on

22   things, my current role really is mostly

23   economics -- the numbers, the financial math. So

24   I just am telling you that so you know where I'm

25   coming from.

1   And I would try to think up a funny story,

2   but I don't have one. I have an example, though,

3   of something similar to what was talked about in

4   some prior presentations and that is I have an

5   example of an interoperable system that is easy

6   for customers to use, we have it at our

7   headquarters in San Diego at San Diego Gas and

8   Electric headquarters, and it's basically a

9   system where we have several different EVSE

10   represented and one place where employees go to

11   charge and they go up there with a pin number if

12   there's no RFED card, there's no credit card,

13   they go up with a pin number and they enter it in

14   and it identifies them as a unique individual,

15   and then the system records the use through a

16   variety of different charging equipment. And

17   then we build them internally; that was something

18   that we chose to do. Anyway, there has been a

19   lot of interesting learning in the development of

20   that system, implementation of it, and then again

21   looking at the data.

22   I think the thing I want to emphasize here

23   ties to what David was talking about from Nissan,

24   and that is this seamless easy experience, this

25   is something that's really important and I think

1 you're going to hopefully see that in this

2 presentation because that's what I'm really

3 focused on, in addition to the express scope of

4 this session.

5   So this is the workshop scope, I'm putting

6 it up here just to acknowledge that, you know, I

7 read Leslie's document and so, you know, what

8 should the CEC do to support interoperability,

9 this thing in the red box there, I think, gets to

10 what David was talking about and the scope of

11 this session, which is the user, the customer,

12 that there was the concept of one credential

13 listed in the prep document, location and

14 reservation, changing networks without replacing

15 or retrofitting EVSE, all the things that have

16 been in the presentations, I'll talk to those

17 things, too. I'll also quickly cover the other

18 questions that were in the prep doc about the

19 availability of data and state priorities and

20 payment methods.

21   So with regard to evaluation criteria,

22 these are things that we think these are kinds of

23 evaluation criteria that should be put forth on

24 the proposal of any new kind of system. You

25 know, those that work, has it been proven to

1 work? Is it widely used? Security, privacy,

2 fraud protection, these are important things.

3 Those are often forgotten, especially when we're

4 trying to cut costs, but obviously we know how

5 important those things are and, you know, the

6 other sort of things that are easy to forget as

7 far as disputes and reconciliation, that's an

8 important thing, too. We think that's something

9 that needs to have been thought through as far as

10 how it's handled. And then this next point here

11 gets to why I was telling you I'm a former IT

12 professional, is because I used to be the guy in

13 the room talking about enterprise, service buses,

14 and common object request broker architecture,

15 and the business people in the room are saying,

16 you know, "Can we stop using terms and talk about

17 the problems we're trying to solve and how we're

18 going to solve them?" And before we think about

19 creating new systems, naturally we should look at

20 what we have already and how we might be able to

21 apply the things we already have to solve the

22 problems that we're trying to solve at the least

23 cost.

24   And again, that last bullet there just

25 again touches on this whole thing about focusing

1   on the customer. And here we kind of have two

2   levels of customers, we have the EVSE

3   owner/operator and then the more important one,

4   which is the person driving the car and so that's

5   really important.

6   We looked around, given this criteria, and

7   looked for the example and it's the example

8   that's already been talked about today, and that

9   is the credit card system, and we just sort of

10   looked at that and said, you know, what does that

11   look like? And it looks like the 17,000

12   financial institutions, again, back to the

13   question I was asking when I was in the audience,

14   a pretty well established fee structure,

15   everybody knows what it is, one and a half to two

16   percent of the transaction, 10 to 20 cents per

17   transaction. These are common fee structures,

18   very accessible to customers as far as the

19   owner/operator at the station. And again, I

20   acknowledged it's that station owner/operator's

21   option as to whether or not they decide to pass

22   those on to the customer, but overall that's

23   good, that fee structure is good because it's a

24   relatively small amount of money that that

25   station owner has to decide whether or not they

1 want to pass on. Equipment is relatively

2 inexpensive, as little as $10.00. You've all

3 probably seen the little readers that are on some

4 of the iPhones that are used in a lot of retail

5 stores now. So equipment, there's a variety of

6 different equipment, but generally speaking you

7 can get at it pretty inexpensively.

8   And the network is vast, it currently

9 processes a whole lot of transactions, and

10 there's already Government regulation, there's

11 standards, there's specifications that have been

12 applied and thought about for quite a few

13 decades.

14   And then this is just an example of what

15 accompanies that credit card system, this is just

16 an example of the customer benefit as far as

17 making sure that customers have issues with a

18 particular provider of a credit card, that they

19 have a place to express their concern, and then

20 there's an organization behind the scenes that

21 then tracks that concern all the way through to

22 resolution. So this is a good thing.

23   And then on this topic of sort of locating

24 and reserving, let's talk about location first.

25 Again, in the spirit of kind of looking at what

1 we have today, this is just a little screen shot

2 from the DOE's website that has all of the

3 publicly accessible stations available today and

4 there's a little function there that says, you

5 know, plan a route, find stations -- I went on

6 there and clicked on the find stations and then I

7 looked for the one nearest here and I found the

8 one that's in the little box there in the public

9 garage, and you can get details on that.

10   The other thing I want to point to is up

11 there in the upper right you see a little thing

12 that says "Developer Tools," so printing any

13 stuff, right, the DOE is making this data and the

14 interaction with the system behind it, they're

15 opening that up in kind of a potentially

16 interoperable way, right? You can now use that

17 data. So, again, this is another important thing

18 to look at, you know, do we want to enhance this?

19 Or do we want to duplicate it? Do we want to

20 create something else?

21   Okay, so on our reservations, sort of the

22 thoughts that we had is just thinking about

23 reservations and whether or not that should be a

24 criteria potentially for grant recipients is

25 thinking it through and, if you kind of do this

1   on an informal basis and you talk to people about

2   reservations and how that might work, you quickly

3   discover it's pretty problematic, or it can be,

4   it's challenging, it's a very challenging topic.

5   And I think what I'm trying to sort of

6   communicate here with this slide is that before

7   we kind of make that a requirement, I think it's

8   probably more important for us to decide

9   collectively what does a reservation system that

10 works in our opinion, what does that look like?

11 How exactly does that work? Technical people in

12 this world call that sort of use cases, sort of

13 describing the scenarios, you know, and we can do

14 that and we should do that, describe those

15 scenarios in a way that we're comfortable with

16 before we enforce that requirement.

17   And then on this topic of being able to

18 change networks easily with low cost, this is

19 just an example of -- it's a very small selection

20 of the variety of equipment that's available out

21 there to facilitate a credit card transaction.

22 You can see the prices are kind of all over the

23 place, they can go higher than that. There's a

24 variety of different features. And in one case,

25 actually, and I don't think they're necessarily

1   doing a very good job of letting people know that

2   it's out there, but Eaton is already integrated

3   with -- it's an NFC, or Near Field

4   Communications, so no touch credit card reader

5   and magstripe, and Eaton has that option, it

6   allows anyone to use the stations and it's up to

7   the station owner to decide the feed structure

8   and it's up to that station owner to decide

9   whether or not they want to pass the interchange

10   fees on to the customer, so this is again just a

11   couple of good examples of how easy it is to get

12   a hold of equipment.

13   And then another example of a customer

14   benefit, this is just one of many websites that

15   are out there on the Internet where someone, a

16   site owner/operator, can shop for a new provider

17   if they don't like their particular credit card

18   company that they're working with, or the

19   interchange arrangement they have through the

20   bank, they can go here and they can shop. And

21   they can shop based on customer ratings, or fees,

22   or equipment costs, that kind of thing. So

23   again, a great resource that's available to us

24   today. And so boiling it all down to

25   recommendations, really kind of the way we look

1 at it is that we just think strongly that before

2 we develop new things, we should fully consider

3 the systems that we have in place today, the

4 methods that we have in place, all of the

5 different standards that -- some of them are

6 global, in fact -- just to look at those and see

7 how we can leverage them. And we also really

8 like the whole spirit of the show, the cost to

9 charge to the customer at the point of sale

10 before they charge, that's a very good thing as

11 far as just everybody wants to know what they're

12 paying before they buy it, that's good. And

13 there was a specific question about data

14 availability for state funded equipment, and we

15 feel pretty strongly, especially after looking at

16 fairly recent funded projects that getting at

17 that data, the data is very valuable to a lot of

18 people -- policy makers, other business people,

19 you know, taxpayer funded accessibility to some

20 of the data has been challenging, and we think

21 that any further efforts should publish all data

22 just to obfuscate the users. And then, well,

23 that's it. I'll close on that. Thank you.

24 [Applause]

25   MS. BAROODY: Thank you, Matt. Adam

1   Langton, you've got to load your presentation, I

2   think. Adam Langton is Senior Staff Analyst with

3   the California Public Utilities Commission. By

4   the way, Matt's presentation is not in your

5   package, but it is posted online.

6   MR. LANGTON: Sorry about the delay, we're

7   trying to pull up my slides here. All right,

8   there we go. All right, sorry about that. My

9   name is Adam Langton. I'm an Analyst with

10 California Public Utilities Commission and I'm

11 going to give you a little background on what we

12 think the interoperability issues are, talk a

13 little bit about what CPUC's role in

14 interoperability is, and then sort of specific

15 examples of how we've had to deal with

16 interoperability issues on the Smart Grid side

17 and kind of some general kind of broad principles

18 that we've had to use as we approach

19 interoperability.

20   Interoperability is just -- it's a fancy

21 word for how to get two different things to

22 communicate to each other. And when you need to

23 solve an interoperability problem, you usually

24 come up with a Standard. And you apply that

25 Standard to make sure that you can communicate,

1 exchange data, make transactions. So at this

2 meeting right now, we're using -- we had to deal

3 with an interoperability problem, we had to

4 figure out how we're going to be able to

5 communicate with one another, and the standard

6 that we're using is English, and not only

7 English, but we're using spoken English to

8 communicate. So if you came here and you were

9 going to use English and you were going to send

10 us text messages, that wouldn't work. We didn't

11 dictate that as a standard, but it's kind of an

12 understood standard that evolved over time that

13 we use. And furthermore, if you're taking notes

14 right now, we don't require that you use English,

15 you can use whatever standard you want to use,

16 there's not an interoperability issue there, so

17 we don't put a requirement on that.

18   In terms of interoperability with a

19 charging station, there's kind of three

20 categories that I'm listing here, but I think

21 there's also a fourth category that I

22 intentionally didn't put on here. The first form

23 that everyone is familiar with is how we get the

24 vehicle to interoperate with the charging station

25 from a physical standpoint, and that's where a

1 couple of our standards come into play, the

2 J1772, CHAdeMO, SAE Combo Standard, those are all

3 standards that allow the vehicle to interact and

4 interoperate with the charging station.

5   Software interoperability came up a number

6 of times here, it's how the software can

7 interoperate with the hardware, and there's been

8 OCPP and other examples of different ways to

9 create that interoperability.

10   The third category that I've identified

11 here is billing interoperability and we talked a

12 lot about that already; cash is a form of billing

13 interoperability, credit cards, subscriptions,

14 roaming and networking are operability, are all

15 different ways that we could enable

16 interoperability between a user to pay for the

17 service that they want to use.

18   A fourth category of this is a little

19 more general, broader, it's the communication

20 that we want to enable between the different

21 entities involved, and I didn't put that on here

22 because we haven't really defined exactly what

23 communication we need to take place, to make

24 these transactions take place. If you are trying

25 to enable a Demand Response transaction, or if

1   you're trying to enable different kind of grid

2   services from a charging station to the grid,

3   there's a lot of different players that could be

4   involved in that. You have the driver, you have

5   the vehicle, you have the charging station, you

6   have the facility, you potentially have the

7   utility, and you potentially have the wholesale

8   market. So all those different entities could be

9   involved in those kind of transactions. So to

10 figure out what kind of interoperability we want

11 to enable there, we'd need to first make a list

12 of what kind of transactions that we want to

13 enable, and once we figure that out, then we

14 could start to say, okay, now that we understand

15 those different types of activities, those used

16 cases, as Mark mentioned, then we'd say, "Okay,

17 well where are the interoperability issues?" So

18 we wanted to find that first and we don't know

19 what all those different communication activities

20 or all those different activities are going to

21 be, and we don't know exactly who is going to be

22 involved in that yet, whether the utility is

23 going to be involved in it, whether the wholesale

24 market is going to be involved, and then we still

25 need to sort that out because, when we sort that

1   out, it's going to determine who, whether you

2   need the charging station involved, whether a

3   network is involved, and things like that. So

4   that's a key step that we need to take to figure

5   out what are the totality of the interoperability

6   issues.

7   So what is CPUC's authority here? CPUC

8   regulates investor-owned utilities and that's

9   kind of the beginning and end of our authority.

10 When we started on our electric vehicle

11 proceeding, one of the first questions we had to

12 ask ourselves is whether a charging station is a

13 utility or not. And we had a phase of one of our

14 electric vehicle proceeding that looked at this

15 and decided that charging stations are not

16 actually utilities based on the Public Utility

17 Code that defines what a utility is. And this

18 was later enacted by AB 631, put into statute

19 that said charging stations are not utilities.

20   When we continued on that proceeding, we

21 had to ask ourselves whether investor-owned

22 utilities were allowed to own charging stations

23 and we said they're not allowed to own charging

24 stations, at least the charging stations that are

25 used in public areas. They're allowed to own

1 charging stations that are used for their own

2 fleets, for their own employees, and things like

3 that. So given these two decisions, the CPUC

4 doesn't have any direct authority related to

5 charging station interoperability standards.

6 Potentially as we go down the road and look at

7 the different use cases related to how a charging

8 station and a vehicle can interact in the grid,

9 that may bring up some issues where the utility

10 has a role in this, and if the utility has a

11 role, then it's going to be important to

12 determine what communications standards are used

13 to enable that transaction between the vehicle or

14 the charging station and the utility, so that

15 could bring up some issue that the Commission

16 needs to address.

17   Some of these issues that have come up

18 here, that are mentioned, some options for

19 addressing interoperability, were dealt with in

20 the energy settlement that we released last year.

21 But I want to clarify that those issues that we

22 addressed here, vehicle interoperability and

23 billing interoperability, were specific to the

24 context of that settlement. And they shouldn't

25 be interpreted as kind of the Commission's policy

1   toward interoperability and EVSE

2   interoperability. These were done within the

3   context of a settlement where we were trying to

4   make sure that there was value for the ratepayer

5   in that settlement. And to do that, we put on

6   some billing interoperability requirements and

7   required that the fast charging stations have

8   credit card swipes, that was one of those

9   requirements. And in terms of like the vehicle

10 interoperability, we required the use of both

11 CHAdeMO charging stations and also the SAE Combo

12 standard, as well, when that's ready and

13 available on the market, NRG is required to use

14 that standard, as well.

15   But here, this shouldn't be interpreted as

16 kind of the Commission's policy or statement on

17 what EVSE interoperability should be; instead,

18 it's our interpretation of what's required to

19 make sure that there is ratepayer value, here

20 where NRG is using ratepayer money to build as

21 part of a settlement, to build the charging

22 stations. So I wanted to clarify that.

23   Now, CPUC has dealt with a lot of

24 standards issues as part of the Smart Grid

25 proceeding, so this is an issue that we've come

1 up with, approached a number of times in the

2 broader form of Smart Grid Standards, and we have

3 a few kind of rules that we've tried to apply in

4 that context that I think might be valuable here

5 in the EVSE interoperability context.

6   First, you have to really determine where

7 you need a standard and where you need

8 interoperability and where you don't, that's the

9 first step. And once you've identified a point

10 that requires interoperability, a few principles

11 that we tried to apply are to, 1) avoid a

12 California only standard, and this is really

13 tough because on the one hand California is

14 pushing ahead of the other states at the national

15 level, and pushing this technology, and in

16 pushing the utilities to work together with the

17 other Smart Grid technologies out there, and when

18 you don't have standards, when you're trying to

19 be out in front, you often don't have standards

20 in place. And so it's a challenge where we could

21 dictate a standard and say "this is what we're

22 going to use," but by doing that we could end up

23 with a California only standard that becomes

24 outdated, that we have to replace later on when

25 there's a new national standard, and that's no

1 longer acceptable to companies that are operating

2 on a national or international basis. So it's

3 one of the things we try to avoid.

4   We've also tried to avoid proprietary

5 standards, that's a standard where some entity

6 owns it and can charge royalties for it, and if

7 we were to adopt that in a way that it forced

8 customers, energy companies, or utilities to use

9 that standard, we could be in a situation where

10 we're creating greater costs for all those

11 entities.

12   To help us avoid a California only

13 standard, what we've done is we've worked

14 together with some of the national standards

15 bodies to accelerate the standards development

16 process. Staff at CPUC sometimes participates in

17 that process to help communicate what we think

18 are the important objectives and activities that

19 we're trying to facilitate, and also make sure

20 that the utilities are involved in that, and also

21 provide an opportunity, a forum, to test out

22 different standards and use that as a way to help

23 accelerate the process.

24   And finally, we do sometimes find

25 ourselves in the situation where there's multiple

1 standards and that already exist, and what we

2 want to do there is avoid picking one and saying

3 that that's the standard before the market has

4 had a chance to weigh in on that issue. And so

5 an example of this that we applied in the NRG

6 settlement was we didn't want to just have the

7 CHAdeMO Standards charging stations, we wanted

8 NRG to also use the SAE Combo Standards, so that

9 was a requirement that came out of that

10 settlement. That's pretty much the approach that

11 staff is using on kind of an informal basis.

12 These are not principles that have been adopted

13 in a particular decision, but if you look through

14 our Smart Grid Decisions, you'll kind of see

15 these four principles kind of emerging as a way

16 we've approached the Standards issue. And that's

17 all I've got for now. [Applause]

18   MS. BAROODY: Thank you, Adam. Appreciate

19 it. All right, next up is Paul Stith. He is

20 Legislative and Policy Advocate for Plug in

21 America. Welcome.

22   MR. STITH: Well, great. It's good to see

23 many of the folks I know and meet some new people

24 that are a part of making EVs a success. Plug in

25 America is really the voice of the consumer, so I

1 think I'm in the room speaking on behalf of the

2 consumer. I am going to welcome all of your

3 questions. Our family, we no longer have a gas

4 car, we actually have two Leaf and we are driving

5 something on the order of 24 to 27,000 electric

6 miles a year, and it's a great experience and

7 we're really looking for anything that the State

8 can do that can actually reduce the barriers to

9 more families moving this way, more businesses,

10 and anything that can be done to increase

11 adoption, that's all that Plug in America is

12 about.

13   My presentation is a little bit more

14 broad, a little bit more like Rajit in terms of

15 these are some of the things that we're thinking.

16 I'm going to highlight actually where that

17 intersects with this particular session so that

18 it is going to make sense, and what is fantastic

19 is all the points have generally been made

20 already, so I get to say who I already want to

21 call out thanks to in terms of process. And like

22 Matt, I'm a recovery IT person, so I actually do

23 know the back office type things in terms of

24 protocols, I'm a former Government worker, and I

25 do a lot of things in the private sector, so I'm

1 glad to be here.

2   Plug in America has been around and came

3 from a really early time in the EV business where

4 we're pretty much activists, and if anybody has

5 been part of this space for a while, we were

6 actually out protesting just across the street

7 not that many years ago, and so what's fantastic

8 is that we're here, we're inside the building,

9 and you're asking us for our opinions. About 50

10 percent of us are actually here in California, so

11 pretty good odds, a good number are in Washington

12 and Oregon, and the rest are distributed around

13 the country and, of course, around the world.

14   We've been pretty active and actually

15 towards the industry, driving initiatives that

16 maybe even industry gave up on, Plug in America

17 actually saw it through, held out support for

18 investment tax credits, has done an incredible

19 thing with regard to Federal and State and

20 Regional activities, so I just wanted to make

21 sure that you understand we're with you, anything

22 we can do to create a viable market out of this.

23 And a plug-In Day plug, September 28th and 29th,

24 find your Plug-In Day and go there and

25 participate. I'll be in Cupertino.

1   For the purposes of this discussion, SB

2   454 has actually -- we want to thank Senator

3   Corbett, of course, we want to thank the EVSPs,

4   Synergy, Chargepoint, Ecotality, Greenlots, for

5   supporting us because that's actually what

6   drivers need, they need open access. They don't

7   really care about the internals of how does this

8   protocol get there from here to there, they want

9   a fair and a safe transaction that's transparent

10   to them. So in terms of this session, 454 has

11   actually accomplished a lot of the goals of what

12   the ZEV Action Plan has been out to accomplish

13   from the driver's point of view. And we need to

14   make it work for the market players, of course.

15   We're active in a lot of spaces within the

16   PUC, within again, the Governor's ZEV Action

17   Plan. Ask us for our opinions. We're drivers,

18   we're doing this, we're surviving without home

19   charging, we're surviving without workplace

20   charging. You'll find our membership and

21   supporters know a lot of the answers intuitively

22   already, so we appreciate the chance to talk.

23   Again, Mike had it from the OEM side about

24   the data. We as drivers have our intuitive feel

25   for the data, we create our own data, we do our

1 own surveys, we understand what's going on. But

2 we feel that the State should have a role with

3 regard to data access and that is something that

4 is, whether it is location-type data, more

5 towards driving the proper infrastructure

6 investments, finding out that 70 something

7 percent of Ford drivers are charging at home on

8 120-Volt, for example, is a pretty important

9 piece of data that we want to work with. And I

10 think it's a high number of *Leaf* and every other

11 one, so we want to get that data and that's

12 actually at a partnership with the EVSPs, of

13 course, and the OEMs that have access to that, so

14 I think the State should do anything it can to

15 encourage data access. We all know the charging

16 triangle or pyramid, or however Mark would like

17 to call it, of the day from EPRI, but it all

18 falls in line in terms of our priorities,

19 charging at home, workplace, Level 2, specific

20 high demand locations that are going to enable

21 trips, that are going to be, say, a hotel that

22 you'll take the electric car instead.

23   Open access in terms of our priorities,

24 that's pretty much number one, and we're well on

25 our way to actually having that as a standard

1   within California, so we can all go home now --

2   no, lots more to do, obviously lots more to do.

3   We do see that the State has a role, an

4   understanding about the drivers and which new

5   categories of drivers, whether it's 50 percent,

6   or more, that may live in urban areas, you know,

7   apartments, there needs to be infrastructure

8   that's certainly available to them for charging

9   capabilities and really working hand in hand with

10   where they work, and finding solutions, and I'm

11   going to have a slide about that.

12   All in all, just to make sure everybody --

13   it is a learning process, so as we're studying

14   this, learning it evolving, we jumped off a cliff

15   as a family, as a driver, without a DC Fast

16   Charger, we did it, we survived. Now the DC Fast

17   Chargers, we're super happy that enables

18   additional mobility, we got rid of our old gas

19   car when we felt confident enough, so it's about

20   reducing risk.

21   Consumers, frankly, they want it to be

22   easy, they want it to be cheap. And don't fool

23   yourselves that they won't figure out how to get

24   it the cheapest possible way. They're going to

25   constantly be evaluating how much does it cost

1 for me to get home, how much does it cost for me

2 to get to work? There's a new mindset that

3 you'll actually see that you don't actually get

4 with petroleum-based fueling. What you do with

5 petroleum-based fueling is you pull into the

6 fueling station and you complain, you might

7 swear, but you fill your car and you move on. In

8 electric, your biggest access to energy, whether

9 it's 110, a driver can actually make choices,

10 they say, "Well, I can wait and have coffee," "I

11 can change how fast I'm driving." You can do

12 different things, so start to think and realize

13 that the consumers are doing this all the time.

14 And the plug-in hybrid drivers, they're also

15 making those choices, as pointed out, about

16 should they use petroleum, or should they

17 actually use electric. So these are customer

18 things, consumer things, always ask that

19 question, how is it that they're thinking.

20   Transparency, obviously stated. The

21 Better Place note from Hawaii, consumers were

22 complaining they didn't know how much fuel they

23 were receiving, there you go, consumers actually

24 kind of know and if you interact with them,

25 you'll learn about that. I do participate on the

 1 NIST Working Group and that's one of the first

 2 things that I'm going to stand up for every time

 3 is transparency and the consumer being able to

 4 know, how much is it going to cost them in order

 5 to get home.

 6   Again, OEMs here have pointed out

 7 primarily people are charging at home.

 8 Surprisingly, they're actually willing to wait a

 9 long time in some cases to get charged, probably

10 while they're sleeping. It works out pretty

11 well. So that's something for the State to keep

12 in mind and, unbeknownst to me, the CEC actually

13 has some programs -- they're giving away money

14 for home charging that are hiding on Tuesdays,

15 David, that I didn't even know about. So what

16 the CEC can do in terms of priorities, there are

17 still things certainly in the home area. And if

18 you want to buy a *Leaf*, buy it on Tuesdays

19 because you can get a free home charger. Yes,

20 and now it's out, we didn't know that. People

21 are going to adopt EVs, they're going to enjoy

22 them, and they're going to think everything

23 possible how to get a second one and get rid of

24 the gas car. It's a fact of life, it's going to

25 happen, and so we need to think about that and we

1 need to think a little bit about from the State

2 whatever we can do on education for the rates,

3 PG&E -- a shout out to them, they just put up a

4 new rate calculator, the rates are out there,

5 we're trying to help consumers make choices.

6   Workplace. Think about it in terms of

7 what we're really trying to do. We love and

8 appreciate what Good Will is able to do, but the

9 small and medium businesses are not actually able

10 to easily jump into the game. There are costs in

11 front of it for them and we want to figure out

12 what is it that they really want to accomplish in

13 a workplace program. And what we feel is that

14 it's going to have them take an electric car to

15 work, and not because it's free fuel because they

16 could have charged somewhere else. We really

17 want to encourage new commutes that wouldn't have

18 happened with electric, and you can do 25-30

19 miles a day on top of whatever charging they

20 receive at home in 120. 240 -- there are market

21 solutions coming out to show those, but think

22 about it that it's per hour, that you're actually

23 able to free fuel that car, enables commutes, and

24 we do know people that go all the way from, say,

25 Pleasanton through to the Valley and they have to

1 get a full charge, they need one, they need 240.

2   The caution to this is that the success of

3 these programs that we're seeing in the Valley

4 and these are the companies that can afford to

5 put in some of the best charging infrastructure,

6 they're oversubscribed and that actually leads to

7 anxiety and quibbles at work, and Vice Presidents

8 unplugging other people, and it's real, and so

9 you need to be thinking about that actually as

10 the State invests into programs for low cost ways

11 and then employers know what they're getting into

12 so they don't create a nightmare because they

13 enable a few employees. And it goes without

14 saying, the data and understanding and education,

15 managing those programs. Facilities people, if

16 they don't drive an electric car, they hate them

17 because it's actually a very difficult job to

18 manage a fleet of growing people that can't get

19 home without charging.

20   This slide actually -- I think I'm almost

21 right there -- it gets really to the heart of

22 this. We feel that the business models will

23 evolve to match the needs, and we don't pick

24 winners either. We do know that drivers, when

25 presented with this cost option, if they are

1   starting to think that roaming will cost them,

2   that they express an interest of like, "Well,

3   gee, I can just have two cards." And that goes

4   right to the heart of it, is that drivers will be

5   creative, they will think about it, and as much

6   as we all do want it to be seamless, in these

7   early days while we figure it out, roaming may

8   not be something we can afford. So we do want to

9   think about it in those terms because a driver,

10   the first time that they are presented with a

11   station that they can't interoperate with,

12   they'll figure out how to get there. And if a

13   credit card due to SB 434 is the first way they

14   interact with that station, and they find out

15   it's prevalent where they go, they'll subscribe

16   or they'll become part of that network. But we

17   want to get them through those pain points and we

18   don't know yet what the State's role would be in

19   financing that.

20   Mapping and driver locations certainly

21   important. And whether it's NREL data, as Matt I

22   think was sharing, or PlugShare, or other ways,

23   we do need to know where the stations are and if

24   they're available. That's what I've got for

25   driving electric. How many in the audience are

1 driving electric? Fantastic. Thank you very

2 much. [Applause]

3   MS. BAROODY: Thank you very much, Paul.

4 Next up, our last speaker for the morning is John

5 Halliwell. He is Senior Project Manager of

6 Electric Transportation at EPRI.

7   MR. HALLIWELL: Thank you very much for

8 the opportunity to speak here today. I just

9 wanted to say a few things about EPRI if you're

10 not familiar with us. We are a not for profit,

11 we do research in the public interest, kind of

12 along those lines. One of the things we don't do

13 is advocate policy, so hopefully my slides will

14 point out issues and, after 10 presentations on

15 this with experts, I don't think I'll have

16 anything new, but hopefully I can reemphasize the

17 points that I think we think are pertinent to

18 moving this forward. But I'm not going to give

19 you the conclusion on what we think you should

20 do, that's really up to the CEC and the State of

21 California. And I am living proof there are EV

22 drivers outside of California, so -- I live in

23 Knoxville, Tennessee.

24   I want to point out four key interfaces

25 that I think exist, that have been addressed in

1 different ways today, but I think these are some

2 really keys to making this move forward. You

3 know, interface 1 is the Consumer interface to

4 the charge station, and that happens in a number

5 of different ways. I'll talk a little bit about

6 that. There's the network that is behind the

7 EVSE, there's Internet work activity between

8 different network providers, they're the Arrow 3,

9 and then there's the access to real time

10 information that might exist in those networks,

11 the status of a station, making a reservation,

12 those sorts of things, so those are those four

13 areas.

14   Right now, the Interfaces 1, 2 and 4 are

15 proprietary for the most part. I think how

16 people identify themselves at the charge station,

17 how the EVSE talks back to the network in the

18 U.S. primarily, and then this real time mapping

19 access, those are done through proprietary

20 interfaces. I think Ecotality and Chargepoint

21 have both opened up their mapping capabilities

22 through APIs, through the Cloud, but those are

23 proprietary interfaces and I think it was Mike

24 Tinskey mentioned that Ford has -- there's a cost

25 associated with having multiple networks like

1   that.

2   For the most part, this interface doesn't

3   exist, this internetwork interface, and

4   Collaboratev has been put together to try and

5   address that within the U.S. Hubject is looking

6   at that in Europe. So I'm going to talk a little

7   bit more about that.

8   When you talk to consumers, you know,

9   right now they have a lot of different things

10   that they may have to carry with them to use

11   charging. I've seen key fobs, I've seen RFID

12   cards, I carry one of the RFID cards in

13   Tennessee, we primarily have the one particular

14   brand of chargers, so it's not a big issue for

15   me, but in some places you may have to carry

16   multiples. And as consumers, this is somewhat an

17   inconvenience and I would have said this is just

18   an inconvenience until you hear the issue that

19   came up in Hawaii where the fobs that were issued

20   to consumers were proprietary, that company went

21   out of business, and now those charge stations

22   will have to be physically changed out to

23   maintain their function, and that's a cost that

24   doesn't need to be there if things were done in

25   an open fashion, so that's important.

1   The other question that you might want to

2   think about is do all public EVSEs need to be

3   networked, and I think Mike commented that Ford

4   feels like they should be, but it is something to

5   think about. There's a cost associated with

6   making that happen. It does provide a number of

7   functionalities and features you will not get if

8   they're not on a network, but is that something

9   that needs to be there? That's something to

10   really think about.

11   When you look at the network portion, that

12   is from the EVSE back to the service provider, if

13   you choose networking, then there are two key

14   takeaways I wanted to point out and you can see

15   that their information flow is something that can

16   happen, the authentications and using processing

17   transactions, that can happen. But if these

18   networks are proprietary, it has two key

19   consequences, one is that, as someone that puts

20   in a charge station, so if you think about the

21   site host as being a consumer of charge stations,

22   they have to make a choice, and it may mean

23   there's a limited number of charge stations that

24   support a particular network, so you're limited

25   in your choices of, you know, type of equipment.

1   And if you turn that around, once that charge

2   station is installed, it can only support the

3   networks that were designed into it upfront

4   without having to replace hardware. So it can

5   lock people in, and if there's a proprietary

6   network, then that host needs to think about

7   that. If there's a way to do an open network

8   where, in a year from now, or two years, you

9   know, when I look at my service as a host, and I

10 say, well, hey, somebody else is offering a

11 different product, then that openness, having

12 something that's not proprietary can be a big

13 advantage.

14   The Internet work in Interface provides a

15 number of functions, it can achieve this sort of

16 interoperability for consumers, that is being

17 able to roam from station to station without

18 having to carry multiple identification cards. I

19 guess the one thing that comes to mind there is

20 that, if something like Collaboratev goes forward

21 in the U.S. and it's widely adopted, if you have

22 a network provider that doesn't join that

23 Collaboratev, then that leaves a hole in the

24 system, it doesn't gain you that full roaming

25 capability, so it's very important that if

1 there's a collaboration site like that, it needs

2 to be all encompassing if it's going to make this

3 go forward.

4   Real time information, this sort of last

5 interface right now, PlugShare is one of the

6 common apps that people have on their phones, you

7 can look up charge stations, I guess NREL

8 maintains a database at the DOE, there are a

9 number of these. Each of the vendors that have a

10 network also have their own sites, but it's

11 somewhat scattered from the consumer perspective,

12 again, it's more of a convenience sort of thing

13 by bringing those together. I think Collaboratev

14 is looking at providing this as a functionality

15 in their system; right now, it doesn't exist that

16 way. And without this link, then reservations or

17 live status data for stations is just not

18 available, and it's mainly a convenience issue

19 for the consumer.

20   So where the market might go in the

21 future, I mean, sort of the status quo, and

22 that's what this slide would be, you're going to

23 see a continued mix of ways of identifying

24 yourself to an EVSE, whether it's proprietary or

25 open, there's probably a mix of those. You might

1   see OCPP used to go between the EVSE and

2   networks, you might still continue to see

3   proprietary networks, so there's sort of a mix of

4   technologies is what you kind of expect and in

5   some cases you may have a network that is totally

6   isolated and others that will be joined, so the

7   status quo, sort of where you go, is kind of

8   where you end up.

9   And to summarize, I tried to put together

10 if you have proprietary interfaces, then there's

11 some consequences of that. Consumers have to

12 carry multiple credentials, you have to belong to

13 multiple networks, you have to have accounts with

14 different network providers to be able to roam.

15 Fielded chargers can be locked to particular

16 network charge stations. The designers of the

17 charge stations have to support multiple networks

18 if they want to reach a broad market, and there's

19 limited access to real time data, it's in pockets

20 that you have to gain access to. If you go

21 forward with interoperable solutions, then you

22 start having standard credentials, or this

23 interchange between service providers that allows

24 your information to carry across. And I guess

25 the one that I wanted to highlight here is the

1 one that we don't talk as much about, which is

2 between the EVSE and the service provider; that

3 seems like a critical link in terms of not

4 stranding assets and, you know, the announcement

5 Monday that Ecotality is having financial issues,

6 this really -- I was glad I had highlighted this

7 because, having proprietary interfaces at that

8 point can strand assets, but more than that, it

9 locks a host site into one particular product

10 that seems to be constraining in something that,

11 from the Open Standards perspective, that's where

12 EPRI has been involved in this is with SAE, we

13 really want to push the openness that will help

14 the whole industry go forward.

15   And I did have one I somehow managed to

16 miss. So this cautionary tale from Hawaii that

17 somebody had mentioned I think earlier this

18 morning, who was that, Brad, I think, had talked

19 about that. I initially had thought of this

20 consumer interface as being more of an issue of

21 inconvenience, and then I heard about the issue

22 in Hawaii where it literally was locking these

23 charge stations from future users who didn't have

24 the right credentials and they can't get them, so

25 there are a couple interfaces here that I think

1 are critical, that if they're not open they can

2 strand assets, and that would be this consumer

3 interface and this network interface. I think

4 those two go beyond just convenience of

5 consumers, they go to the interoperability of

6 things going forward. And that's all I have. So

7 thank you very much. [Applause]

8   MS. BAROODY: Great, thank you so much.

9 And thank you to all the speakers for really

10 great presentations. We're at a point now where

11 we can have some more Q&A, so if the second group

12 of speakers would come up, we have -- I know it's

13 five until 12, so if everyone is willing to spend

14 about 10 minutes, let's say, with some Q&A, that

15 would be great.

16   All right. I saw Richard first.

17   MR. LOWENTHAL: So I just wanted to sort

18 of augment maybe what you said, John, about the

19 better place issue. So it wouldn't matter how

20 much software interoperability you have there,

21 you have a station that has a reader that there's

22 no longer a credential to read, so that hardware

23 has got to come out. And similarly with

24 Ecotality, just because I hear a lot of people

25 thinking there's an easy solution to Ecotality,

1 but when you have connectors that melt, you have

2 to go out there and change hardware. So there's

3 like no substitute for having good product and no

4 matter how much software you throw out of a

5 melting connector, it's not going to fix it. So

6 I don't want people to look at software standards

7 as a panacea for fixing bad equipment.

8   MR. HALLIWELL: I guess one thing I would

9 say, so if you look at the Ecotality situation,

10 the concern I have wasn't so much the connectors,

11 that's certainly an issue, but not one I was

12 addressing. I was thinking more along the lines

13 of the network and the fact that, if their host

14 server goes down, that network is idle. Now, I

15 don't know what that means, I don't know if that

16 means the charge station just ceases to function,

17 or if it's suddenly open, that is, that the site

18 host wanted to charge a dollar an hour and

19 suddenly it's free and there's nothing they can

20 do about it, and that's a concern. And they

21 can't just simply call Chargepoint and say, "Hey,

22 put mine on your network" because it uses an

23 interface that won't talk with Chargepoint, and

24 so --

25   MR. LOWENTHAL: We won't take that melted

1 connector anyway.

2   MR. HAWKINS: Dave Hawkins, kn-Grid. I

3 thought one of your points was very interesting,

4 is that we do most of our charging at home,

5 residential. And I look at the price for a Type

6 2 charger and I'm looking at $1,000 to $1,500,

7 which is a bit of a show stopper, so I'm curious

8 as to how the OEMs and others are thinking about

9 how do we get the price down, how do you

10 encourage that? What kind of interoperability

11 should it have with that? It's behind the meter,

12 but, you know, the CPUC was also looking at some

13 of the issues about sub-metering and how you do

14 all of that, so I'm curious as to what your

15 thinking is, where it's all going with the

16 residential part of the charging, and what should

17 be the interoperability piece and how that should

18 interface with the utility or EVSEs.

19   MR. ZEREGA: Oh, thank you. A real quick

20 answer that doesn't fully get to the spirit of

21 your question, but we have chargers at our

22 workplace, they're $500.00 each, and they're from

23 Clipper Creek and they work really well. And we

24 have access control and metering on those, and we

25 find that better than 90 percent of our employees

1 who have vehicles, and there's 44 of them at our

2 location alone, they're served through that

3 eight-hour day with those $500.00 units, and we

4 have access to control metering.

5   MR. STITH: I was going to add to that

6 that, yeah, the $500.00 -- the sub-$500.00 EVSE

7 is here, they may not initially support the

8 higher charge rates, so you're getting Level 2,

9 you may get like five kilowatts out of them,

10 something like that, which is fantastic, it's

11 phenomenal. You're asleep. So it should work

12 out just fine with that. So that's one of the

13 barriers that people need to get through is the

14 education, actually. And the CEC does have some

15 programs which are interesting to learn, that you

16 can actually still get free EVSEs in California.

17 I just got to know the right place to go.

18   MR. LANGTON: One more thing I'd like to

19 add to this. We have an employee, a couple of

20 employees, actually, that had a *Leaf*, and now

21 they have a Model S, they still drive 12 miles to

22 work. So in other words, their charging needs,

23 even though they drive the Model S, it'll take,

24 what is it, a 90 KW or something? Even though

25 they drive the Model S now, they still drive 12

1   miles, which means Level 1 still serves them.

2   They get there faster.

3   MS. BAROODY: Great.

4   MR. TINSKEY: Just real quick, to address

5   the second point of your question. So, yeah,

6   agreed, price points are falling, especially in

7   the basic, and we're following those price points

8   down. But, you know, work that is going on with

9   some of the CPUC is there's a challenge to get

10   more people on top of these rates because drivers

11   typically enjoy lower rates and lower cost to

12   transportation, and sometimes in the State of

13   California, that means a second meter, which is a

14   pretty cost prohibitive installation. So I'm

15   encouraged by some of the work that Adam is doing

16   and some of the work that you actually can get

17   that barrier into one install potentially and

18   allow the customer to really drive on low cost

19   electricity.

20   MR. LANGTON: And one thing I guess I'd

21   add to that regarding the communication with the

22   utility, there's still a lot of I guess unknowns

23   there as to how that exactly works. Does the

24   charging station communicate directly with the

25   utility, or does it go through a network? And if

1   it goes through a network and the network

2   communicates to the utility, you have different

3   requirements for those different communication

4   legs. So we have to make a little more progress

5   on that before we determine what the requirements

6   are and what we want to use the standard on. And

7   what we say, well, we don't need a standard for

8   this because this communication is taking place

9   between two entities that is kind of internal to

10 them, we don't need a standard there. So I think

11 there are still a lot of unknowns that we're

12 thinking about internally and we hope to address

13 through a new Electric Vehicle proceeding at some

14 point in the near future.

15   MR. ZEREGA: A couple more things on that

16 to all the time of use thing and also on the

17 metering thing. There are, at least in our

18 service territory, we have time of use rates that

19 are whole-house, so it includes the car, so

20 there's no extra meter installation needed, and

21 the other thing that I think is important to

22 stress with regard to rates in general, when you

23 kind of compare home charging and workplace

24 charging, is that what we've observed is that the

25 moment that charging at work is even a penny more

1 per kilowatt hour than it is at home, like

2 charging you wouldn't believe the drop-off, and

3 it's because most employees live, at least in our

4 service territory, somewhere between like 10 and

5 15 miles, you know, 85 percent or more. And so

6 what we've sort of been discovering is that, as

7 the rate at work, even on a time of use basis, or

8 whatever, as it gets equivalent to the home, then

9 you see people charging only when they need to.

10 In other words, you see a lot of people parking

11 in the spots, but not even plugging in, even when

12 the price is even a penny higher, so it's this

13 rate thing and managing usage, and everything

14 else, it's all interrelated and it's important.

15   MR. WOLF: Great discussion. John, a

16 question for you. There's been a lot of

17 discussion about, you know, protecting site

18 owners, making sure -- you spoke about stranded

19 assets -- are we sure we're not trusting the site

20 owners to make those decisions if it's not

21 involving any other problem? Are we saying that

22 the site owners cannot make that decision, do I

23 need to like Linux versus Microsoft or Apple, are

24 we saying we can't trust the site owners to make

25 that decision? Because you showed benefits of

1 interoperability on one side, and then you showed

2 all the cons of the proprietary networks, you

3 didn't show all the benefits of the proprietary

4 networks, which there are a lot of, and there are

5 a lot of cons of interoperable -- of Standards-

6 based solutions, like the ones we spoke about, a

7 standard that is not fully complete, or that

8 needs to go. So do you think that we should

9 basically choose for the site owner? Or should

10 we allow them to choose OCPP-based, proprietary-

11 based, or other standards-based software?

12   MR. HALLIWELL: I guess what I was trying

13 to do was list out pros and cons, I didn't put it

14 in those terms and on my networks, but I did list

15 that, you know, the remote connectivity you can

16 do maintenance so that, if you're a coffee shop

17 owner, you don't really want to be the person out

18 there checking things out, then you can rely on

19 your network provider. So there are services,

20 they provide -- you're probably asking me there a

21 policy question, if they can mandate that, I'm

22 not going to say one way or the other, but I

23 think the bottom line is that that's the

24 education piece for the site hosts that have to

25 understand that there are consequences to

1 choosing a network. Open protocols mitigate that

2 to some extent, so if the EVSE uses a protocol

3 that's common across all the network providers,

4 then it's not an issue.

5   UNIDENTIFIED SPEAKER: The example you

6 gave about [indiscernible] --

7   MR. HALLIWELL: That's true. If OCPP

8 doesn't offer a feature that you have unique,

9 then that's possible.

10   UNIDENTIFIED SPEAKER: [Indiscernible]

11   MR. HALLIWELL: I don't know. I mean,

12 that is again a policy question and I just will

13 state consequences.

14   MS. BAROODY: There we go. We have time

15 for one more question.

16   MR. CHERKAOUI: This might be a four-fold

17 question, in fact, it's such a great discussion.

18 But I'll try to keep it simple. The first one

19 was for Paul, you know, you mentioned that EV

20 drivers now always figure out the cheapest way

21 and how to plan around their EV driving. Do you

22 think it's because most EV drivers today are

23 early adopters and very enthusiastic, therefore

24 they figure out the cheapest way, rather than the

25 most convenient way for, let's say, mass

1   adoption? That's the first question. The second

2   one is with respect to mostly home charging. I

3   live in the City on Hyde Street, so just where

4   the Cable Car starts, and it's really great,

5   there are four EVs there and they're parked in

6   the street the whole time, so I'm trying to

7   figure out where everybody charges and it turns

8   out that everybody charges at work. And you

9   know, this is one of the key pieces because EV

10 driving is mostly city driving and obviously not

11 everybody has access to a garage or a carport.

12 And then two more pieces, Brett. The first one,

13 we talked about efficiency and using credit card

14 transactions. Small transactions have limits you

15 know, when all the providers actually charge a

16 flat fee when the transaction is below $10.00 or

17 so, so it actually makes it a lot more a .1 or 1

18 percent, it goes to 10 percent almost. And then

19 the last piece about, you know, connected EV

20 charging. One of the things we've seen in

21 Europe, in fact, one of probably the best

22 examples of electric driving is the City of Paris

23 that I look at the 3,000 parking spots with 3,000

24 cars for car sharing, 20 percent of which are

25 available for private charging. It's going to

1   6,000 at the end of this year. And there are

2   about 50,000 subscribers and the most important

3   wide majority say -- and they're paying quite a

4   bit for a service -- they say that it's

5   reservation, the ability to just be able to

6   reserve a parking space where they know where

7   they're going with their EV is really key.

8   MR. STITH: I think I get the first one,

9   so -- I'll try the second. The question is, is

10   it just these geeky early adopters who are green

11   penny pinchers who will figure out the rates.

12   Okay, I think that's the question. And the

13   answer is they will figure it out faster and then

14   the other folks behind them will figure out darn

15   soon that they are not getting all the benefits

16   of driving electric. So we're looking at this as

17   that we're funneling however many hundreds of

18   dollars a family might have been putting into

19   petroleum-based transportation that we're trying

20   to maximize that, so in a session if I have a

21   driver that, I mean, education is continual. We

22   have drivers that actually think they're doing

23   great because they're paying $200.00 in

24   electricity instead of paying $450.00 in gas, and

25   actually, if they were on the proper rate, they

1 would pay more like $50.00. So they do learn,

2 they do find out continual education, and I think

3 that, as people change their mode of

4 transportation they become acutely aware of what

5 a kilowatt is, it's just a matter of time. And

6 they do learn, I think it's in their better

7 interest and, by the way, their friends are going

8 to be comparing things in a social way, and

9 they're going to learn that they're a fool for

10 paying $200.00 extra dollars. It'll happen.

11   MR. ZEREGA: I'd like to --

12   MS. BAROODY: Okay, one more comment.

13   MR. ZEREGA: -- add something real quick.

14 I mean, I agree, it's going to be more than just

15 tech geeks that are going to figure out that, if

16 they're driving a plug-in Prius, or a Ford Energi

17 that at $.25 a kilowatt hour, you can basically

18 go the same distance -- let's say your budget is

19 $4.00, I'm going to go somewhere and I'm going to

20 spend $4.00 on my fuel, I can go the same

21 distance on gasoline or $.25 electricity. The

22 second that $.25 electricity goes up above that,

23 they're not saving any money. The average

24 American is going to figure that out. And if the

25 price of electricity with all the other backend

1 fees and stuff stacks up and leads the station

2 owner to price at or above that, it's not going

3 to be helpful for the EV community. And then the

4 comment on the credit card transactions, my

5 understanding is that the per transaction fee, or

6 minimum transaction amounts, that's entirely up

7 to the retailer. It's entirely up to them. The

8 interchange fees don't have those kinds of

9 restrictions.

10   MS. BAROODY: Okay, thank you. I think

11 we're going to take a break for lunch, I'm sure

12 everybody is hungry, ready to go out. Thanks for

13 your attention and thank you, speakers and

14 panelists, for wonderful presentations today.

15 It's been very beneficial. [Applause] So we'll

16 reconvene here at 1:00. Thanks.

17   (Break at 12:15 p.m.)

18   (Reconvene at 1:20 p.m.)

19   MS. BAROODY: So if we could have the

20 panelists for the second session, if they're

21 here, please set right up. I'll call you by

22 name. So we need Rajit Gadh, Brett Hauser, Bill

23 Kramer if he's here, Jordan Ramer, Tim Lipman,

24 Richard Lowenthal, and Paul Stith. Okay, we'll

25 just take a few minutes to gather everybody.

1   Okay, I think we're going to get started

2   here now. We have our panelists available. Why

3   don't we just go down the line and introduce

4   ourselves one more time for everybody. We'll

5   start right here with Bill.

6   DR. KRAMER: Hi. I'm Dr. Bill Kramer from

7   the National Renewable Energy Laboratory. I work

8   in Energy Systems Integration research area

9   there. I've been involved in Electric Vehicles

10 since the early '90s. I managed an Electric

11 Vehicle Program at Idaho National Engineering

12 Laboratory from about '94 to'98.

13   MR. LOWENTHAL: I'm Richard Lowenthal with

14 Chargepoint.

15   PROFESSOR GADH: I'm Rajit Gadh. I'm a

16 Professor at UCLA, Director of the Smart Grid

17 Energy Research Center in New York on Smart EV

18 Charging.

19   MR. HAUSER: Brett Hauser, President of

20 Greenlots.

21   MR. STITH: Paul Stith with Plug in

22 America.

23   MS. BAROODY: Thank you. And with me is

24 Randall Winston who will help moderate the

25 session. This will last about an hour or so.

1 And we'll also want to involve the audience with

2 questions at some point. So I'm just going to go

3 ahead and read the four questions and we're not

4 going to necessarily take them one at a time, but

5 just knowing what the questions are, if we could

6 just start talking about some of the answers.

7 So the first one is: 1) what should be the

8 State's role in supporting industry efforts to

9 develop interoperability Standards? 2) What

10 should the State prioritize in a EVSE

11 solicitation to support the development of

12 network interoperability, driver access, cost

13 reduction, or other priorities? 3) What current

14 business models exist in the EVSE market with

15 regard to interoperability, and should the State

16 provide financial or other support for these

17 models? 4) What criteria should future State

18 EVSE solicitations require with regard to EVSE

19 interoperability? So those are the questions

20 that are on our mind and we'd love to hear from

21 the panel. We've already talked a lot about this

22 this morning, but we're going to dig a little

23 deeper, perhaps. So whoever would like to

24 volunteer first.

25 MR. WINSTON: Maybe just before we begin,

1 we had one other gentleman join us. If you don't

2 mind introducing yourself and where you're from?

3   MR. RAMER: Sorry about that. I got lost

4 in Sacramento. So I'm Jordan Raymer, CEO of EV

5 Connect. We are an enterprise class solution

6 provider for electric vehicle charging, and I'm

7 happy to be here.

8   MS. BAROODY: Thank you.

9   MR. WINSTON: I wanted to talk a little

10 bit about the driver -- let's call it roaming --

11 I'm going to adopt whoever started using the term

12 "roaming" because I think it's actually

13 clarifying.

14   MR. LOWENTHAL: So Chargepoint at its

15 current position is kind of -- is better off

16 without it because it forces people to come to

17 us, but we think that's not good for the industry

18 and we have fully embraced the need for drivers

19 to charge everywhere, for pricing to be clear,

20 for people to find stations when they need them

21 because we think it grows the whole market. So

22 indirectly, it helps us in that we think there

23 will be more drivers and they'll be happier and

24 all that. It's really clear to us what we need

25 to do, which is to put in an interface to a

1 standard for interchanging information with the

2 other players. So we kind of know exactly what

3 to do to do that, and I think it's up to the

4 State. If the State really wants to make it so

5 drivers can charge anywhere, then we need to be

6 encouraged, and we probably need to do it in a

7 timely way, we need financial support. It is not

8 a strategic issue for us, so we're doing this in

9 the interest of creating a better market, not in

10 the interest of advancing Chargepoint sort of

11 selfishly. So honestly, I think anybody -- we'll

12 all be in that position where, since it's for the

13 greater good, it's hard to justify spending a lot

14 of our current funds there, and I think the State

15 could help out. And I still think it's

16 reasonable for the State to require us to spend

17 half the money or whatever, but since it's not

18 core to us, it's hard to justify frankly to my

19 Board of Directors to spend money on something

20 that just invites a lot of -- all of our current

21 drivers, our 40,000 drivers, to use other

22 people's equipment. That's the way they look at

23 it, it's not so good for business, it doesn't

24 make a lot of business sense. So if we want to

25 do it, I think we need to be encouraged -- so I

1   think 454 has enough teeth, Senate Bill 454, for

2   the mandatory side of this. But I think to

3   accelerate it, State funding wouldn't help a lot.

4   You know, we've suggested some forms. I think it

5   should probably be competitive, it should be a

6   pot of money that whoever needs it to advance its

7   cause can compete for however the State wants to

8   run that offering. So we are ready to do it, we

9   could sure use some help to do it quickly,

10 because it is otherwise not strategic to us.

11   MS. BAROODY: Thanks, Richard.

12   DR. KRAMER: If I could step back, I

13 guess. The definition of interoperability, I

14 think, is important here. You know, I think

15 quite a bit has been discussed today and this

16 morning, I quite enjoyed ABB's definition in

17 terms of the different interfaces, and you know,

18 I think if we only focus on one of those circles,

19 I think we are doing ourselves a disservice in

20 terms of the type of research and types of things

21 that I think the State should be funding. So I

22 think in terms of interoperability we have, yes,

23 the consumer, but we also have still issues

24 between the charging stations and back to the

25 vehicles in some cases, some cases we have it all

1 the way back up to how it is that that charger is

2 going to be controlled, for instance. One thing

3 we don't want to do is end up in the same kind of

4 situation that we have had with our utility

5 meters, where we don't have enough smarts in our

6 chargers, or when we go out to implement and we

7 put out a bunch of public charging stations, I

8 think we would be remiss in not considering

9 things such as perhaps in the future some sort of

10 a Vehicle to Grid type charging capabilities. So

11 I think when we talk about interoperability,

12 unless I'm mistaken from the Governor's Office, I

13 think it's more than just, yes, we want to

14 increase the penetration of plug-in type

15 vehicles, be it electric, be it hybrid vehicles

16 with charging capability, and I think in the end

17 that is the objective, is to try and increase the

18 penetration, but not end up in a situation where

19 a station, for instance, let's say somebody does

20 go bankrupt, we certainly don't want to have a

21 bunch of EVs and all of a sudden they can't get

22 from Point A to Point B.

23   So I guess the one thing I must ask is,

24 going back, what is our definition of

25 interoperability in the context to which we're

1 discussing?

2   MS. BAROODY: Randall, do you want to take

3 that one on?

4   MR. WINSTON: I'm going to actually kick

5 that back to the group and the reason why is

6 because I think we're here today to define that.

7 I actually think that, just to be candid, the

8 Governor's Office, we didn't quite understand the

9 full definitions of interoperability as the

10 Action Plan was being drafted. As it was being

11 drafted we I think openly held out the caveat

12 that it's an evolving document, you know, that

13 everyone who was present at our stakeholder

14 meeting that we had last September, I think, felt

15 that this is a market that's evolving and

16 everything that we're naming or sort of trying to

17 stake as goal posts or targets might sort of

18 change, or we'll have to adapt to. I think

19 interoperability is actually one of those issues.

20 I would sort of hesitate to give a definition one

21 way or the other because I really want -- I would

22 like to see and I think the Governor's Office

23 would like to see some consensus around that

24 definition from you all.

25   MS. BAROODY: Go ahead.

1   PROFESSOR GADH: I'd just like to add to

2   that in terms of definition, I think first of all

3   based on the presentations today, I think

4   interoperability -- and this is pretty typical

5   when any discipline is in sort of the early

6   stages, it's sort of a big elephant and everyone

7   is trying to figure out -- touching a piece of it

8   and trying to figure out what it is. So I think

9   that that interoperability -- first of all, we

10   need it, I mean, if we don't have it, it's like

11   in the telecomm space, GSM was a big thing that

12   came out of Europe where a cell phone could talk

13   to the cell tower, and in America we have

14   proprietary technologies like CDMA, but then they

15   leapfrogged the GSM capabilities. And then now,

16   you know, that GSM technologies are catching up.

17   So it's in the early stages. But I think that

18   looking at what we mean by interoperability based

19   on some of the presentations today, I think

20   everybody has their own view and I think two of

21   those points are mentioned here, for PEV drivers

22   to access charging stations and to backend

23   software management platforms. I think beyond

24   that, there's the networking, there are all the

25   algorithms, there's mobile apps, mapping, so if

1   you have a mapping app capability, you shouldn't

2   have to build APIs for everybody, right, there

3   should be some interface. So I think there's a

4   lot of scope for defining what we mean and I

5   think the definition is not completely clear

6   right now.

7   MS. BAROODY: So it sounds like we could

8   actually have more input on where we need

9   interoperability in this whole realm. And I

10 think actually Adam brought that up in his

11 presentation and basically that really made sense

12 to me, you know, where do we need

13 interoperability? Let's define that first. So I

14 think that's what Bill is trying to get at.

15   MR. HAUSER: And to that point, as Rajit

16 pointed out, we do have two areas that we've

17 defined where interoperability is important; one

18 is we're calling roaming interoperability for a

19 driver to be able to use multiple charge stations

20 irrespective of what network platform they're on,

21 and then, two, making sure that any charge

22 station can communicate with any backend network

23 management system. So those are the two points,

24 there's network interoperability and data

25 roaming. And I think that the Government's

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1   responsibility in part is to allow the space to

2   evolve, you know, to scale, and it can be

3   flexible because it is such a nascent industry,

4   and there are things that we have yet to

5   understand, things we're going to learn, other

6   technologies that will evolve, and so we have to

7   enable those people that are going to be making

8   investments in the initial rounds, with this

9   first generation of technology, the ability to be

10 able to upgrade that, or change networking

11 systems and solutions without having to throw

12 away the investment they've already made. I

13 think that's the first thing, that's very

14 important, and that's on the network

15 interoperability.

16   And then with respect to the driver

17 roaming, I'll kind of repeat what I said this

18 morning, I think especially in this domain,

19 there's so many things that are happening around

20 what drivers experience, the driver usages, we

21 don't have a lot of data points yet back about

22 what their experience is like, what they do like,

23 what they don't like. The ones that are coming

24 back are somewhat limited in scope because they

25 really don't have a lot of optionality that they

1 can pick from, whether it's RFID card, credit

2 card swipe, whatnot. I do know we see clients or

3 site hosts that are putting things out, are

4 trying to allow for a whole suite of offerings

5 that anyone can pick. They can have an RFID

6 card, they can pay by credit card, they can pay

7 by phone, and they can use a mobile app. And so

8 they want those because they want to learn and

9 understand what it is exactly that the customer

10 is going to prefer.

11   And as I also said this morning, I mean,

12 we've been used to piling up credit ever since we

13 probably were in college and got our first credit

14 card and didn't know what the hell to do with it

15 except that it got us things, and a credit card

16 can still get us things, it can still get us

17 electricity, and we don't have to change consumer

18 behavior about how they purchase things if we

19 allow that to be one of the main components of

20 how we create for -- I don't know if you would

21 call that as much "roaming" or "interoperability"

22 as "open access."

23   MS. BAROODY: Okay.

24   DR. KRAMER: Maybe another way to think

25 about this is -- I think really what we're trying

1 to address are the roadblocks that are in front

2 of us for the implementation and penetration of

3 this transportation means. And it's not that I'm

4 trying to open it up even further, but when we

5 look at what the roadblocks are, many of them

6 have a tendency to be how do you pay for it,

7 where is that next charging station? Many of

8 these things have been growing out of just a

9 small pool of folks who were early adopters, but

10 now that we're seeing the numbers from the

11 automotive companies that the penetration is

12 increasing, when I think about it, I look at what

13 are the roadblocks that are stopping us from

14 getting these types of activities out there. And

15 when I think of interoperability from my

16 perspective, I can't help but think about what is

17 the interoperability back to the utility? What

18 is the interoperability of three vehicles that

19 may be sharing a transformer so that I don't blow

20 up that transformer, and they're not all charging

21 at the same time? When I think of

22 interoperability -- that's on the electricity

23 side -- when I think of interoperability of

24 chargers inside of a building, or in a residence,

25 I think about how can that charger be

1 interoperable with the other load devices that

2 are in my home so that I can be a good steward

3 and be able to shed load when I might need to for

4 time of day use?

5   So, I guess my idea when I came here was

6 that interoperability is larger than I think that

7 I've heard generally spoken today in the original

8 presentations. Each individual, each individual

9 area has, of course, its own merits, but I want

10 to emphasize that what we're trying to do here is

11 we're trying to increase this mode of

12 transportation, that is the objective, and

13 interoperability is what we believe is the major

14 roadblock. And in the end, if I ask my mom, and

15 I asked her, "Hey, mom, which car do you want to

16 pick, is she going to pick an electric vehicle,

17 or is she going to pick a fuel cell -- pick a

18 fuel cell vehicle! Way up there -- or pick a

19 normal vehicle, and she would not have the tools

20 herself in order to determine what was good, what

21 was bad, you know, be able to have her just able

22 to understand how to make that choice. And I

23 think in the end what we want is that choice to

24 be no different almost than any other type of

25 choice that you might make. So again, I'm not

1 trying to open this up to what are all the

2 roadblocks for EVs, or devices that need to be

3 charged; in the end, I think that's part of the

4 question that we're trying to answer.

5   MS. BAROODY: That's good. I think we'll

6 explore that a little bit more in our second

7 panel, as well. Paul?

8   MR. STITH: Yeah, definitely. So,

9 Randall, to the whole point of this is that

10 you've got roaming looked at as a holy get us all

11 a lot of things, and if you step back a little

12 bit and determine what have we accomplished so

13 far, if 454 goes through, the drivers are able to

14 charge without regard to which network they

15 subscribe to. And through their behavior and

16 where they are, they will learn maybe they want

17 to become a subscriber, that makes it more

18 economical. I used that theme earlier. Drivers

19 are going to be studying continually does it make

20 sense for them to move forward with something.

21 So we feel that the roaming part might be more

22 expensive in terms of investments today versus

23 other things on the priorities list, so not to

24 lose sight of it, that it's important, but we

25 could be talking about a transaction only happens

1   once or twice a month and it may only happen once

2   or twice for each driver until they solve it.

3   They may pick up that other RFID tag, they may

4   move with the market. So I would try to separate

5   charging anywhere at any time and hope that we

6   can check it off the list that we've already made

7   progress, and then look for the state whether

8   it's going to make any sense to require

9   interoperability moving forward in terms of the

10 roaming side.

11   Another point, and this goes back to being

12 able to charge and -- not really

13 interoperability, I'm going to call it non-

14 operability -- and that is that, if a station

15 network is down, that you should actually be able

16 to charge. And I think that might be something

17 you'd want to consider. I believe some vendors

18 do support that and that satisfies a lot of --

19 some of the concerns, and it certainly would give

20 an incentive to repair a station if its ability

21 to collect funds was not available.

22   MR. WINSTON: And just so I'm clear, if

23 it's not roaming in your mind that's sort of at

24 the top of the list priority-wise, what are those

25 priorities?

1   MR. STITH: Well, in terms of enabling

2   drivers, that we see other things possibly in

3   terms of the mapping capabilities that can

4   actually be solved possibly in software sooner,

5   faster. And certainly we pointed to some of the

6   datasets that we'd like to see available, more so

7   to the state in terms of planning infrastructure

8   and understanding behavior. So it's push it out

9   and look at when we would solve it according to

10 the market.

11   MS. BAROODY: Paul, could you take just a

12 moment, I hate to put you on the spot, but could

13 you just recap for everybody here what SB 454

14 will accomplish if it goes through? Just a few

15 bullet points?

16   MR. STITH: So what we looked at with SB

17 454 is that, if you're a driver of a gas vehicle,

18 you're very familiar with pulling up to a

19 station, it may be open 24/7, but maybe not.

20 When you get there, if you need fuel, you're able

21 to purchase fuel for your vehicle, and that's

22 something that people can trust, they may have a

23 higher price for it, but they're able to purchase

24 it. And typically it's a credit card transaction

25 that is a common -- the least common denominator

1   that vehicle drivers will have, so 454 gives an

2   opportunity for that. It has a provision with

3   regard to encouraging signage to help vehicle

4   drivers find signage that they're looking for,

5   and it does have a provision with regard to

6   roaming interoperability in I think it's 2015 is

7   the stake that's out there in the ground, to help

8   with the adoption rates. Our research within the

9   community is finding that, as people are so cost-

10 sensitive that, if roaming increases the cost,

11 then roaming might not be doing an early service

12 to the adoption rates.

13   MS. BAROODY: Okay, thanks. Appreciate

14 it. Jordan.

15   MR. RAMER: Yeah, thanks. You know, when

16 I hear the conversations, I take it back to the

17 way we think about this, and I didn't do very

18 well in Economics, but I'll give you the way I

19 think about it. I think it just comes back to

20 there's two things, there's an ROI for the site

21 owner and there's an ROI for the driver, and I

22 think the State's role is to figure out how to

23 improve that ROI, or maximize that ROI for both

24 of those stakeholders. And to the extent you can

25 do that, all the other technology and all these

1 other things kind of fall into place. And so,

2 when you look at the ROI for the site owners,

3 which is really the world that we live in, it

4 comes down to how do you create an environment

5 where all the players in the market, including

6 companies like EV Connect, can compete for the

7 site owner's attentions, and win the business in

8 a way that is cost-effective for them. And then,

9 when you look at the driver side, it's in a way

10 that the drivers want to buy Electric Vehicles

11 that they enjoy using them, and that it's a cost

12 effective mode of transportation compared to the

13 alternative. And then, from there, you can just

14 take a tree down and, to me, what I just

15 described is 35,000 feet, and today's earlier

16 presentations were probably more like 5,000 feet.

17 And so the State needs to think about how we

18 probably go from the 35,000 feet down to 20, and

19 then go down deeper into that to make an impact.

20   MS. BAROODY: Okay.

21   MR. LOWENTHAL: A counterpoint to a couple

22 things --

23   MS. BAROODY: Of course.

24   MR. LOWENTHAL: -- that were raised. So

25 the roaming piece, I just want to focus on the

1 roaming piece. You're right, there are other

2 pieces of interoperability that are quite

3 interesting, but just focusing on the roaming

4 piece, it may not be the prescient issue today in

5 that we're starting, but you know, I've already

6 shipped 40,000 of the wrong tag, I'm shipping 200

7 a week of this tag, I'm shipping 150 stations a

8 week to somebody, and to the extent that we don't

9 grab a hold of this issue now because it's early

10 days, that might not be wise. You may want to

11 grab a hold of some of these issues before we go

12 too far out into the weeds of our directions.

13   MR. HAUSER: But why is it our problem

14 that you have the wrong RFID cards?

15   MR. LOWENTHAL: I'm not trying to make it

16 anybody's problem, this is a problem that we may

17 want to collectively address sooner, that's all

18 I'm saying. We may want to address the problem

19 sooner than later, so I'm not talking about

20 money, I'm talking about when. And so, yes,

21 correct, is this may not be the biggest issue on

22 the list today because things are small, not that

23 many drivers, they're kind of tolerant, they're

24 used to bending over backwards to figure out how

25 they charge their car, but it doesn't mean we

1 should address this issue sooner.

2   MS. BAROODY: Okay, thanks. Anybody else

3 like to make a comment? Matt.

4   MR. HAUSER: I would just say, again, even

5 with respect to RFID cards, I mean, are you using

6 my fare compliant RFID cards?

7   MR. LOWENTHAL: No.

8   MR. HAUSER: It goes back to Standards,

9 too, like when we roll out RFID cards --

10   MR. LOWENTHAL: Standards compliant --

11   MR. HAUSER: -- yeah, but -- okay, you're

12 right --

13   MR. LOWENTHAL: -- Standards, but it is a

14 standard. Just like Collaboratev is all

15 standards-based, too, so you can't stand

16 completely on this standards high ground, we are

17 all using standards, we just haven't agreed on

18 which ones, so --

19   MR. HAUSER: No, but when we start putting

20 public money into play and how it should be used,

21 then it is relevant, what's the best thing for --

22   MR. LOWENTHAL: Agreed.

23   MR. WINSTON: I'm just going to jump in

24 with a question really fast here, and it's on the

25 list. I would be interested to hear each of your

1   specific input. And that is, if the State were

2   to have a future EVSE solicitation at the CEC,

3   what would that look like? And what should the

4   criteria be? And very specifically addressing

5   that question.

6   MR. RAMER: Could you just clarify which

7   question?

8   MR. WINTSTON: It's number four. That of

9   was kind of hitting specifically on what the

10 criteria should be, and what might that look like

11 very specifically from where you sit. And I'll

12 open this up, of course, to the audience, as

13 well.

14   PROFESSOR GADH: I think one of the things

15 is, to me, it seems that, again, this is probably

16 repeating several times, but this is in the early

17 stages of this discipline and I -- because one

18 thing I want to say, you know, we have a very

19 small number of organizations here in the sense

20 that there's many many more organizations in the

21 world that are working in this space; 2) this is

22 not going to be a zero sum gain, this is a growth

23 opportunity, a phenomenal growth opportunity, and

24 I mean, you know, this can become into a mega

25 industry in its own right and there are things

1 that we can't even imagine now that, for example,

2 some students are playing around with fun stuff

3 like putting some TV screens on charging stations

4 and connecting them to mobile phones, and things

5 like that, so to me it is very early to put

6 straightjackets on things. That means that when

7 the State is giving support, there should be room

8 for some new concepts, some creative ideas, some

9 technology development, and in terms of standards

10 like what we were just talking about earlier, you

11 know, if the discussion of multiple standards, so

12 interoperability itself needs a clear definition.

13 So I think that Jordan talked about the 25, 50 or

14 million -- I don't know how many -- 35 --

15 whatever -- however high Jordan is -- go as high

16 as he's saying and go even higher, and so in a

17 sense there is still some investigation here, but

18 I think if we are to put California -- and I

19 think the key is we're talking about the State of

20 California having led so far, but we want to keep

21 that lead, and California brings a lot. I mean,

22 I'm going to throw something new here, solar with

23 EV, we didn't talk about that, okay? And putting

24 a solar EVSE interface, where the EVs are going

25 to be used to help fill in when the sun doesn't

1 shine for a few minutes. So we're just in very

2 early stages of this technology, and that

3 technology could be in the EVSE. In fact, one of

4 my students is putting in it right now, so there

5 needs to be plenty of scope for us to innovate

6 and be creative, and keep California -- and we

7 have Silicon Valley, I mean, so I think that it

8 should not be straight jacketed.

9   MS. BAROODY: So, to that point, so if we

10 require that all EVSE that we funded did not

11 allow for vendor lock-in, for -- just come right

12 out and say it -- so if we were to do that, what

13 would be the negative consequences? Would there

14 be any negative consequences?

15   MR. LOWENTHAL: So I'll suggest one. This

16 will be an exciting topic to discuss, I think.

17 If you did that right now, of our 30 percent of

18 customers who charge money for charging, they

19 couldn't do it because there is no

20 interoperability standard existent today that

21 allows people to charge for charging. And so

22 you'd be eliminating a business model, you'd be

23 eliminating a lot of customers from the EVSE

24 market who won't do it without that. So if the

25 standard is robust, and ready, and does what

1 people want, that's one matter; but if you make

2 mandates that they restrict the business models,

3 and they eliminate people from buying EVSE, it's

4 not good for drivers because there's not enough

5 EVSE. If you were to ask what problem is worse

6 today, is there enough EVSE, those are too hard

7 to use, I think most people agree that there's

8 not enough. So you have to be cautious about the

9 side effects of mandatory decisions.

10   MR. HAUSER: Although, I mean, I agree

11 with the last point, you have to be cautious.

12 We're on OCPP and we accept payments through

13 mobile apps, through RFIDs, and through credit

14 card swipes. So --

15   MS. BAROODY: Okay. We have some

16 questions here in the audience also. Jason?

17   MR. WOLF: Yeah. Just to get an

18 understanding because I think to tie all these

19 three comments together definitely in my view, if

20 you limit to one type of requirement, you're

21 going to stop some kinds of innovations and we

22 don't know how they're going to want to

23 communicate. But also, if you look back, and

24 that goes to the point about success, today, how

25 many of the charging stations, Brett, do you have

1   that are running your software in the U.S.

2   running?

3   MR. HAUSER: In the U.S.?

4   MR. WOLF: Yeah.

5   MR. HAUSER: Upwards of 200 -- 1,200

6   nationwide.

7   MR. WOLF: How many do you have, David, in

8   the U.S.?

9   MR. LOWENTHAL: 12,000.

10   MR. WOLF: 12,000. I think we have to be

11 careful of -- and I love OCPP and I love

12 standards coming in, but I think the discussion

13 about timing, I think that's where the problem

14 comes. Bill mentioned this, we all go through

15 this, the question I would ask everybody to

16 answer is, is there a necessity now to start one

17 type of model? Or are we too early to decide

18 that? The same thing for Collaboratev, I don't

19 think it needs to be the only roaming, credit

20 cards are great.

21   MR. RAMER: Well, you now, just to address

22 that, I don't think that Leslie's question was

23 about any particular standard, I think it was to

24 avoid stranded assets --

25   MS. BAROODY: Correct.

1   MR. RAMER: -- and so I would answer yes,

2   just a simple answer, but how that is defined and

3   constrained probably needs further discussion.

4   And OCPP is one of those. The other answer would

5   be if there is a proprietary network that they

6   allow for on the network side openness to be able

7   to swap out hardware. And so there's actually

8   two different angles with which to do that if you

9   were to define it that way, and in which case you

10 could answer your question very easily and put

11 that constraint out there, and I think solve the

12 problem.

13   MR. LOWENTHAL: I think to go along with

14 that line of thinking, you know, some of the

15 beauty in the NRG settlement decision was the

16 focus on make ready is where you have common

17 ground. Another that we haven't talked about,

18 the Tesla DC Standard here today, I think it just

19 makes people's heads explode to know that there's

20 actually another one, but we do have common

21 ground there and now with modern EVSE, probably

22 two-thirds of the cost is in the installation, is

23 in the make ready part, as opposed to the

24 equipment itself, so that does happen to be a

25 place of common ground and it might be easier to

1   is nothing is decided yet --

2   MR. HAUSER: I completely understand and I

3   hope that's not the case.

4   MR. WOLF: Okay, that's one thing. And in

5   Better Place's case, there was not one dime,

6   there was a network that was sold for money to

7   another operator, with the condition that that

8   operator replaces the stations not on Government

9   money, on its own money, so that a commercial

10   transaction which is one of the biggest

11   milestones for this industry, that there's value

12   in those networks. So saying that there's -- and

13   even if there was -- even if let's say this

14   wasn't that way and there were 77 stations,

15   looking at that and trying to blow it up as the

16   biggest issue in this industry? I think there's

17   been kind of a capturing of the attention of

18   California by a few that they have a lot of

19   assets in the ground and, you know, I love the

20   modeling and I love OCPP, so it's not about that,

21   but I think that the agenda has been a little

22   hijacked and that's my honest opinion.

23   MR. CHERKAOUI: I would like to contribute

24   perhaps a return of experience from Europe where

25   actually OCPP comes from, in fact, from the

1   homeland, the Netherlands. The City of Amsterdam

2   chose about two years ago to actually avoid

3   vendor lock-in, the Government of the city

4   decided to submit a public tender, a European

5   public tender, for two contracts that would use

6   two backend office, so two software solutions,

7   with two hardware solutions, with the premise

8   that should one of the vendors go for whatever

9   reason out of operation, the other one would be

10   able to use and manage the EVSEs, the hardware,

11   or vice versa. And they asked to use an open

12   source protocol to link to, essentially it's just

13   a language, that would be common. The fact is,

14   the two are operating, the two are working really

15   well today, but should something happen because,

16   as Jason pointed out, the standards are not ready

17   yet, there would be quite a bit of development

18   work to actually use the stranded assets to be

19   working with the others. So even though based on

20   that experience the government has actually

21   provided that, there is still difficulty, it is

22   not a straightforward answer to just say that,

23   unless the standards have been developed and are

24   available and are managed and are implemented the

25   same way, it's still not something that is

1   existing today.

2   And I think I want to say something about

3   the priority of the state and about what -- when

4   you look at from the driver's perspective and for

5   what the State of California wants to achieve,

6   which is really to have accelerating the uptick

7   of EV sales by individuals, I think everybody

8   here agrees that what needs to be there is more

9   charging infrastructure, that's what EV drivers

10 demand. It's a perception rather than can I

11 access this or that. Europe has not had the luck

12 that you guys have here, which is to actually

13 have two large networks with the chances that, if

14 you are in a place, you actually see that there

15 is EV charging; and in Europe, it's not the case

16 yet. But the fact is, and that was one of the

17 reasons, is that's where it comes from, all these

18 breaking up things apart has not allowed any

19 business model that is sustainable. And I think

20 the key question, which I think we all agree, we

21 need more EVSEs to have more EVs, who is going to

22 fund that infrastructure? Somebody has to pay

23 and somebody has to put it in place, and I do not

24 know many models that actually work today except

25 for a couple that really have allowed to put in

1 place EVSEs. There was a great study by U.C.

2 Davis looking at 2,500 EV drivers, there is an

3 overuse of what's installed, so there needs to be

4 more EVSEs today, granted that interoperability

5 is the key, but most important, priorities to put

6 more EVSEs out there.

7   MS. BAROODY: Okay, thanks.

8   MR. ZEREGA: Thank you. Matt, SDG&E. A

9 couple of comments in reference to things I just

10 heard. One thing that I think is important for

11 all of us to remember is that open source doesn't

12 necessarily mean that it's the least cost

13 alternative, all things considered. The comment

14 about stranded assets, no matter what happens to

15 any of the equipment manufacturers or network

16 providers, let's all remember that, and I think,

17 Richard, you mentioned that the cost of

18 installation, three-fourths of it was

19 installation. If the charging station doesn't

20 work anymore, the circuits are still there, okay?

21 So that's important to remember. So three-

22 fourths of the assets really can't be stranded

23 too much. And then, with regard to this triangle

24 or showing the usage, the upside down triangle,

25 or the right side up one where it says, you know,

1 home is the biggest, and then the workplace, and

2 then public, remember when we talk about publicly

3 accessible EVSE, we're talking about the smallest

4 part of the triangle. And if you look at the

5 data that's publicly available for the EV

6 project, they can just do some simple math in the

7 data and you can check me on these numbers, but

8 when the price was free during the EV project, if

9 you look at the data from the point of view of

10 what proportion of the EV driving population on

11 any given day goes out and gets a charge away

12 from home, I think it peaked at like seven

13 percent, so it's not a very big number. I think

14 it was really hovering around three or four most

15 of the time. That's our price of free. As soon

16 as the price comes off free -- and I did do good

17 in economics -- but I know that when the price

18 comes off of zero, you start to see a drop-off in

19 demand. So in terms of solving problems, let's

20 keep this in perspective.

21   And then, now to get back to your question

22 about State priorities, what I'll say generally

23 is that the State's priority should be focused on

24 outcomes, not requirements for specific

25 standards, business models, specifications, not

1 on methods, we should not be focused on methods,

2 we should be focused on outcomes. And I just did

3 some simple math here and I was looking at -- I

4 don't know if it was SB 454, or the prep doc for

5 this session, but it said something like, you

6 know, in California we spent $25 million and we

7 have 4,500 stations. Well, that's $5,556 a

8 station. So I'm just throwing this out there.

9 Maybe one of the things we should think about in

10 any future solicitations is that it results in a

11 cost that's less than that, on average. Maybe we

12 say, hey, if you can bring something in of half

13 of that, you deserve some grant money. And

14 again, I'm just throwing that out there.

15   And the other number I kind of want to

16 remind people of, and it's been spoken to a

17 couple times by a few people in here, and that is

18 for plug in hybrids who have fuel optionality all

19 the time, whenever they're driving they can

20 always go to a gas pump or plug in, let's

21 remember -- and I use plug-in Prius as an example

22 just because it's the one I'm familiar with -- it

23 goes 48 miles to the gallon when the battery is

24 dead, okay? 48 miles to the gallon. That car,

25 when it has to pay $.25 a kilowatt hour all in,

1   that's transaction fees, whatever is paid to the

2   utility, your ROI on the equipment, whatever,

3   it's got to stay below $.25 or that Prius driver

4   is going to say, wait a minute, if I plug into

5   that gas pump over there, the effective energy

6   transfer rate -- and you can go do the math on

7   this, too -- it's 2.5 megawatts; the fastest

8   charging stations out there right now are 50

9   kilowatts. You know, so we really have to be

10 sensitive to outcomes. We really have to be

11 sensitive to what is the price to the driver, and

12 what does the equipment cost because that

13 equipment cost, I think everybody would agree,

14 eventually is going to affect the driver.

15   MR. LOWENTHAL: So I'd like to respond to

16 a piece of that if I could. As I said before, we

17 don't set the pricing for charging at our

18 stations and most of the time the customers who

19 do that do that either because they need that to

20 justify spending the money on the EVSE, or

21 sometimes it's the City who says it's a gift for

22 the public funds if they give away electricity

23 for free, those are kind of the two modes we see.

24 Occasionally it's a fairness issue like in an

25 apartment building where the tenant that is

1 charging its car should pay for that electricity,

2 otherwise all the tenants have to share for it,

3 and they don't like paying for the guy with the

4 $100,000 car. But it is not our choice, it's

5 like we're trying to incentivize a market for

6 people to deploy enough EVSE, so we can give them

7 that choice and they set the price. A lot of

8 times they do what you said, they set it too high

9 and then nobody uses the station, so that doesn't

10 do anybody any good, especially them, and they

11 figure that out. So there is a little bit of let

12 the market be wise about those kind of things,

13 like pricing and, since the guy shelled out his

14 $10,000 or whatever and put it in EVSE, they

15 wisen up pretty soon about adjusting.

16   The other thing I want to say, so I've

17 driven and owned a lot of EVs, so today the fact

18 that I could plug in down the street at a

19 charging station enabled me to drive my electric

20 vehicle, so sometimes it isn't a daily

21 occurrence, I charge usually at home, but I can't

22 use my Model S even to get to Sacramento and back

23 unless there is some public charging, so it may

24 be a small percentage, but sometimes your other

25 driving key is off the fact that there is an

1 available public charging, it enabled me to sell

2 my old Mercedes CLK because I could come here and

3 back because there's charging. So, yeah, the

4 percentage might be low, but I might be an

5 enabler.

6   MR. TEEBAY: Hi. I'm going to go after

7 the same point that Matt made, and that is that,

8 you know, what we really want to do, what my

9 mission is, what my outcome is, the outcome I'm

10 seeking, the County has 2,600 buildings, 50

11 million plus square feet of space, 35 percent of

12 our greenhouse gas emissions are heating,

13 lighting and cooling. We have 12,000 vehicles,

14 including 2,300 patrol vehicles. That group of

15 vehicles, that 12,000 vehicles is responsible for

16 11 percent of our greenhouse gas emissions. We

17 have 101,000 employees, and I don't know how many

18 the state has, but I would venture to say it's

19 probably double that. The employee's commute is

20 24 miles one way, the average employee's commute,

21 that's 32 percent of our greenhouse gases, just

22 their commute. So my focus is how do we get

23 these people to drive electric, and how do we get

24 them to drive electric home? And so when I look

25 at this, we have to put in infrastructure that's

1 low cost, we have to keep the costs low so that

2 when people pull up with their Prius or their C-

3 MAX, and they have a choice between paying $2.00

4 an hour for 12 miles, or $4.00 a gallon to go 40

5 or 50, that that's a false choice, and I know

6 they won't make the choice that's really better

7 for the environment. So we have to find a way to

8 keep our costs low.

9   The other piece that we're really

10 struggling with is interoperability in terms of

11 what happens if we put these systems in, and

12 we've seen the example of Better Place where

13 those machines actually continued to run if you

14 have the key fobs, but there's no record, there's

15 no cost accounting. I mean, we'd read about

16 ourselves in the *L.A. Times* if we were giving our

17 employees free and we had no way of capturing

18 that data. The final thing is, my background is

19 fleets and I know that every time that the fleet

20 management system, the software package that we

21 bought, that that company changed hands, it went

22 to somebody else, our fee structure changed, our

23 agreements changed, and we were powerless because

24 we had to do a solicitation and move the entire

25 fleet system to something else, or, you know, we

1 had to just suck it up and go with whatever that

2 was. So when I see an open back door that lets

3 me select the software provider who is going to

4 manage the network, who is going to manage the

5 hardware, and it gives me that flexibility, so

6 based on price, performance and cost, I can make

7 a decision. That's really important to me

8 because I've seen the other side of that

9 equation. So again, I'm looking at outcomes and

10 what am I going to do to keep my costs low to

11 make this a benefit, and to encourage employees

12 to make the right choice.

13   MS. BAROODY: Thank you. We have one more

14 comment over here, or a question?

15   MR. HALLIWELL: Paul, I'll probably direct

16 this your way. Just thinking about the open

17 access and roaming, I'm trying to get my head

18 around that and then in terms of, so, what the

19 ultimate goal is, and it's part of this defining

20 interoperability. Open access to me implies that

21 you might get multiple bills, maybe that's not

22 the case, or is open access one bill? Maybe

23 Richard, same thing -- I guess, do I have to have

24 multiple accounts, I guess open access means I

25 don't have to have multiple accounts. But just

1 clarifying a little more, you know, what is the

2 ultimate goal of roaming because I think it

3 probably has different implications in near term

4 and long term.

5   MR. STITH: I'll start with this one.

6 This is back to 454, so the good news is that the

7 major charging companies in the room are already

8 compliance to 454, so 454 is just the driver's

9 assurance that they can arrive at a paid station

10 and have a way to pay for that even if they don't

11 have the key fob or the RFID. And the primary

12 way that that might occur is with another credit

13 card over the phone, or a credit card swipe, or

14 another way that they're enable that. So the

15 good news is that level of open access that we

16 seek is actually already in motion, as a state

17 supported initiative. Does that help you?

18   MR. LOWENTHAL: But let me answer -- I saw

19 the other question in there -- that means you're

20 going to get multiple billing sources. You'll

21 pay multiple bills. You'll pay a bill to your

22 credit card and maybe a bill to Blink, or

23 whatever, until we solve this issue. But it

24 reminds me, since 454 was brought back up, I want

25 to go back to your question here, which is now

454 mandates us to do roaming, so to some extent

now we have a State mandate that we adopt

interoperability standard, and the future

networks deployed in California comply to it, so

that's in 454. So if you need an incentive, it's

that the Legislature looks like it's about to act

and make that law that we have roaming. So now

we could use your help to implement the law

because it is not going to be the law, we won't

have this kind of discussion anymore, it's not an

option. We're going to have to do it. So to

some extent, I don't know if it's in this forum,

in this forum we are debating architectures and

things like that, but at some point we have to

talk about how do we comply with the law. And

certainly the CEC could facilitate that

compliance with the law, whatever, but that's not

a decision we need to make, we're going to do it

because it will be the law in California and it's

our most important customer state. So if there's

a way that it makes sense for the Energy

Commission to help realize the impacts of that

law, or if you want to leave it, I use the 30

unfunded mandate thing, you know, if you want to

leave it an unfunded mandate, you could do it,

1   those are not very popular and they're not very

2   effective, but it's going to be a mandate soon,

3   January 1, 2015.

4   MR. WINSTON: The Governor hasn't signed

5   any law with that yet --

6   MR. LOWENTHAL: He may not, he may not

7   sign it.

8   MR. WINSTON: But is a law making its way

9   through the Legislature.

10   MS. BAROODY: We have about 10 more

11   minutes here.

12   MR. ZEREGA: I'll make this quick. So I

13   just have a totally hypothetical question. Let's

14   just assume that it becomes law. Let me paint a

15   scenario and then see if the scenario would be

16   compliant with the law. So let's just say

17   there's 50,000 publicly accessible charging

18   stations across the U.S. and every single site

19   owner/operator chose to install a credit card

20   reader from any one of 100 different providers of

21   credit card terminals, so all the terminals were

22   made by different companies, but all of the

23   terminals supported all major credit cards, and

24   the price to use it at each station was

25   different, some were a penny a kilowatt hour,

1 some were $2.00 a kilowatt hour, or some were in

2 between. And so I as a driver, I could drive

3 across the U.S. and I could slide my credit card

4 at any one of these things, and I get one bill,

5 my credit card bill, whoever I chose for my bank,

6 but OCPP was not implemented. Would that be out

7 of compliance with the law?

8   MR. LOWENTHAL: Yes.

9   MR. ZEREGA: It would?

10   MR. LOWENTHAL: Yes, it would be.

11   MR. ZEREGA: It would be out of compliance

12 with the law, okay. So in that case, if that

13 were implemented, would that be the outcome we

14 were looking for, that we have a national network

15 of 50,000 stations all accessible by any major

16 credit card, I can drive across the U.S., but

17 that is illegal. Is that the outcome we want?

18   MS. BAROODY: How is that not compliant?

19 Can you explain that?

20   MR. LOWENTHAL: Because the law says that

21 we have to adopt a national standard for

22 interoperability by January 1, 2015, and networks

23 that have deployed subsequent to that have to be

24 compliant within a year.

25   MR. ZEREGA: Is that the outcome we want?

1   MR. LOWENTHAL: I don't know.

2   MR. ZEREGA: I think we need to hope

3   that's considered before it becomes law.

4   MR. LOWENTHAL: Yeah, potentially that

5   could be the standard.

6   MR. HAUSER: Until January 15th, I mean,

7   the 1st of 2015, it would be compliant, right?

8   Because it allows everyone to charge regardless

9   if they have a subscription or not.

10   MR. LOWENTHAL: The law is not effective

11   yet, so --

12   MR. HAUSER: I'm saying it wouldn't.

13   MR. ZEREGA: One last tiny comment and

14   that is I think what's inherent in my question

15   and what I'm trying to convey is that that is the

16   risk of focusing on methods as opposed to

17   outcomes.

18   MS. BAROODY: Okay, thanks. We have a

19   question back there. Oh, is that -- oh, it's

20   Mike.

21   MR. TINSKEY: So a little bit off topic,

22   but related, just a question to the panel and to

23   the network providers. As an automotive

24   manufacturer, one of the things we're concerned

25   about is interoperability, but finding and

1   locating public charge stations. So it would be

2   good to get any views you have, and for many of

3   the network operators, of what's your vision. Is

4   that data -- so in other words, a data on a

5   charge station that's available and reservable,

6   is that something you're looking to monetize with

7   the automakers? Or is it something that you look

8   at as the automakers are referrers, right? We're

9   the ones sending customers to those charge

10   stations, so therefore we shouldn't necessarily

11   pay for that data. I'm sort of hinting at our

12   view, right? But, you know, that's the question

13   I guess I have and maybe, Richard, you could take

14   this.

15   MR. LOWENTHAL: I know it's aimed at me.

16   This is a topic that has gotten some work. First

17   I'm going to ask you if you'll give me all your

18   Ford sync data for free, but let's not go there

19   because I already know the answer. So we're

20   going to give away free static data, but real

21   time data should have a service level agreement

22   and a contract because it takes servers and

23   communication, bandwidth and all that stuff to

24   produce it, to produce it in any quality, and it

25   takes vetting and all of that. So what we

1 actually require is that we have a contract with

2 the company to whom we provide it. And will

3 there be fees? Generally, yes, because you're

4 going to want to pay for the extra servers and

5 communication and all that, that it will take to

6 implement it well. So the static stuff, we don't

7 incur any cost to, so we're going to give that

8 away. But the dynamic stuff, we incur a lot of

9 cost to produce it dynamically in terms of a

10 network and server resources, so in order -- so

11 we have to have a way to pay for that stuff. So

12 we require people to enter into a contract with

13 us.

14   MR. TINSKEY: So you're looking more

15 upstream at the automakers rather than the charge

16 station owners? Or both, for that data?

17   MR. LOWENTHAL: No. So we produce that --

18 the network produces that data, the network looks

19 at the EVSE and knows which ones are busy and all

20 that, but then we have to package it up and

21 provide it through an API, and that packaging up

22 and providing it with any level of quality takes

23 money to maintain and has to be paid for by

24 someone. What I can tell you is the EVSE owner

25 will not pay for that, they barely will pay for

1 EVSE. So you know, we just have to find a way to

2 pay for it. And we've always taken the stance

3 that we give data to this guy all the time for

4 free, but he doesn't require a service level

5 agreement, and I'm talking about NREL. So it

6 just depends on that. If you want to get a

7 guaranteed level of service, then there will be a

8 price tag associated with that.

9   MS. BAROODY: Okay, thanks. I think there

10 was one more question.

11   MR. CHERKAOUI: I wanted to rebound on

12 Matt's comments. I think he's got a really good

13 point focusing on the outcome rather than on the

14 middle, is really important. And the second one,

15 to go back to my previous point, you compared

16 fueling times, you know, when it would be the

17 equivalent of having 2.5 megawatts. I think

18 that's the key piece there that says if you want

19 EV drivers to actually have that convenience, is

20 the ability to charge wherever they park, is

21 ubiquitous EV charging which actually requires,

22 therefore low cost infrastructure and models for

23 someone to fund it. And as Richard pointed out,

24 the EVSE owners have a hard time by themselves

25 just funding that stuff, but that's how it's

1   going to be. And in order for EVs to pick up,

2   you need to have as much ubiquitous charging as

3   possible, and that should be the outcome rather

4   than specifying how it's going to be done.

5   MS. BAROODY: All right. Thank you.

6   Let's see, we have about three minutes left.

7   Randall, do you have any other questions or

8   concerns?

9   MR. WINSTON: The data one was one that I

10 had and you guys touched upon it all. I'd

11 actually just ask those on the panel for any

12 final or closing thoughts with regards to the

13 State's role, in particular, obviously in light

14 of the upcoming SB 454, the EVSE solicitation

15 that Leslie mentioned, data, interoperability.

16   MR. RAMER: I'll just take one crack at

17 that. I mean, I think it's important for the

18 Commission to consider competition in the market

19 when it's putting these solicitations out, and

20 making sure that we do have a competitive market

21 as we go forward. And I think whatever gets

22 done, and that's I think where open and flexible,

23 however that ends up becoming defined, is

24 critical to the market and for all of us as

25 stakeholders.

1   MS. BAROODY: Okay, thanks.

2   MR. LOWENTHAL: And I guess I'll add one.

3   A few people have commented that it is early

4   days, I think it's important to acknowledge that

5   there's still a lot of change going on in here,

6   and to the extent -- I'm going to resonate a

7   little bit with this outcome thing -- I think you

8   still want to see competitive ideas and new ideas

9   and new investment in ideas that reduce costs and

10   improves the ease of use for drivers, so I would

11   not get overly prescriptive on things, I wouldn't

12   frankly go to regulation on most of this because

13   you still want us to be creative. It's too early

14   to pick the winner.

15   PROFESSOR GADH: And I think I'm going to

16   echo some of those points. I think you want to

17   encourage creative innovation in this early stage

18   and I think the other piece of it is that,

19   because it's early stage, I think we do need more

20   data on the way consumers are using this and, you

21   know, sometimes data exists, but because of NDAs,

22   it's not available, but I think you do need more

23   data to be able to understand interoperability a

24   little bit better.

25   MR. WINSTON: Thank you. Brad or Bill,

1   Paul?

2   MR. LOWENTHAL: Let me add one more thing

3   since nobody else was jumping in. So we talked

4   about the triangle a couple times today, I want

5   to remind people of a challenge in the triangle

6   where -- slightly off of this topic, but, you

7   know, the big piece of the triangle is home

8   charging, but 41 percent of that in California is

9   in places where the car owner doesn't control or

10 own his garage, so it's multi-family living,

11 either apartments or condominiums. It's an

12 extremely hard market for us to crack. There's a

13 bit of economic justice in it, there's some

14 alignment between people who are rich and have

15 their four-car garage and can afford to put a

16 charger in it, and the rest of us. And so to the

17 extent that the State can help with the multi-

18 family housing problem, that's a very significant

19 problem I think we share in common and it needs

20 to be addressed, and it is a very tough market,

21 but it means 41 percent of Californians can't be

22 in this market at all.

23   MR. WINSTON: Thank you.

24   MS. BAROODY: And we are looking at that,

25 absolutely.

1   DR. KRAMER: One thing I would maybe

2   suggest, I think there's ways for us to get data

3   and for us to normalize it such that proprietary

4   data is not provided, but can help to inform

5   infrastructure. The automotive companies have

6   quite a bit of information at their disposal, at

7   their hand. Making sure that we get the right

8   datasets to inform the proper infrastructure and

9   planning, I think, is very important, especially

10   in the front end of this, being able to site more

11   chargers, I think, is a high priority. Granted,

12   yes, many things are done at the home charge

13   level, but if we're going to actually have a

14   chance over time to extend the range of Electric

15   Vehicles past what we do have, we need to be

16   considering that, as well. There are

17   technologies that have been around for quite a

18   while, battery swap-out, that type of thing, and

19   we really can't determine what the next station

20   owner is going to look like in 2015. And I'm not

21   smart enough to know what it's going to look like

22   in 2020, but I think there are datasets that can

23   be pulled together to help us to put together a

24   much clearer plan in terms of siting and making

25   suggestions as to where infrastructure needs to

1   be placed.

2   MS. BAROODY: I actually have one more

3   question. I was going to ask Richard about NEMA

4   and where is NEMA now, and that whole process,

5   and what do they have to say.

6   MR. LOWENTHAL: So, it's a -- I don't want

7   to pick winners and losers either, but in terms

8   of national interoperability standards, NEMA is

9   developing -- ANSE identified four gaps in the EV

10 standards world of the United States, and they

11 identified these interoperability ones like

12 common authentication, like billing

13 reconciliation method, like station location. So

14 they are drafting those standards, and they're

15 about three-quarters the way through drafting

16 standards for those. And speaking a bit for

17 Jason, but so Collaboratev is building to those

18 standards, those national standards that ANSE is

19 -- that NEMA is developing and ANSE is likely to

20 adopt. And that was in response to a gap

21 analysis that ANSE did a few years ago, so these

22 standards make it so that the driver experience

23 is uncertain, and ANSE has identified them and

24 NEMA is working to fill those with national

25 standards. And my expectation, I got over my

1 skis a little bit when I talked about the

2 national standard being this or that, but my

3 expectation is that that would be the national

4 standard that California would be referring to

5 for interoperability, really roaming.

6   MS. BAROODY: Okay, thanks. All right,

7 any other last minute comments? I think that's

8 it.

9   MR. WINSTON: Thank you, all.

10   MS. BAROODY: Thank you very much,

11 appreciate it. [Applause] We're going to take a

12 five-minute break. How about that? Five

13 minutes.

14   (Break at 2:25 p.m.)

15   (Reconvene at 2:39 p.m.)

16   MS. ALLEN: Okay, so we'll go ahead and

17 get started. I'll introduce myself and then

18 Elise will introduce herself. My name is

19 Jennifer Allen, I'm one of the Supervisors in the

20 Emerging Fuels and Technologies Office, and I've

21 been with the Electric Vehicle Program since the

22 '90s, so with the Energy Commission, I was one of

23 two people who worked on Electric Vehicles back

24 in the old days, the old T van days, and so I not

25 only remember all the skeletons, I still

1   remember where some of them are buried.

2   MS. KEDDIE: And I'm Elise Eddie, I'm

3   substituting for Analisa Bevan, who has a meeting

4   conflict shortly. I am Manager of the Zero

5   Emission Vehicle Implementation Section here at

6   the Air Resources Board, and one of the program

7   areas in my group is the Zero Emission Vehicle

8   Regulations, so you can imagine with the vehicles

9   that we've seen out and on the roads today, we're

10 quite enthusiastic about, very enthusiastic about

11 the automakers and their continued compliance

12 with our requirements. And with that, I'd like

13 to have the panelists go ahead and introduce

14 themselves, and we'll start with Cal on this end.

15   MR. LANGTON: Hi. I spoke earlier, so

16 I'll give you a quick intro, I'm Cal Langton,

17 Director of ABB's EV Charging Infrastructure

18 business for North America.

19   MR. WOLF: Jason Wolf, CEO of

20 Collaboratev.

21   MR. HAUSER: Brett Hauser, President of

22 Greenlots.

23   PROFESSOR GADH: Rajit Gadh, UCLA.

24   DR. KRAMER: I'm Bill Kramer from National

25 Renewable Energy Lab.

1   Ms. Allen: So what we're going to do is

2   follow the same format. I'll go ahead and read

3   off the questions, and then what we'd like to do

4   is talk about whether or not there's anything

5   within these questions that hasn't been covered

6   under previous discussions, so that we're not

7   going back over the same material. So let's go

8   with whatever is new that you see in these

9   questions.

10   So: 1) What are the advantages of

11   ensuring that EVSE in California have hardware

12   interoperability? Are there any disadvantages?

13   And if so, what are they? 2) What are the

14   overlapping issues and relationships between

15   network and hardware interoperability? Where do

16   they intersect? And what are the future

17   implications of adopting network interoperability

18   without hardware interoperability? 3) How can

19   the open Chargepoint protocol used in Europe

20   serve as an example to California? So we'll just

21   open it up if you'd like to jump in.

22   MR. HAUSER: I do think we have touched on

23   some of these throughout the day, so as long as

24   you don't mind us going over them again. That

25   being said, I would say the disadvantages, again,

1   the risk that was brought up was one, the other

2   thing that was brought up by Richard earlier was

3   that, if there is some functionality the de facto

4   standard doesn't allow for and someone else's

5   proprietary standard has that, then that

6   particular customer would not be able to get that

7   functionality until it was brought into that open

8   protocol. I think one of the speakers, it

9   actually might have been Cal earlier today said,

10 you know, with their customer base -- I don't

11 know if they're on -- there's been two versions

12 of OCPP released thus far, 1.2 and then 1.5, and

13 2.0, at least the roadmap and functionality is

14 being released in Q4, but I believe whatever

15 instance they're on, I think it covers 98 percent

16 of their customer requirements. So there is a

17 risk, I think it's a very low risk.

18   PROFESSOR GADH: So I'd like to answer

19 this question, what are the advantages of

20 ensuring that EVSE in California have hardware

21 interoperability. And I look at just like what

22 happened in the WiFi space, the price of the

23 product, the price of the charging station will

24 come down and my challenge to my students of

25 having a $99.00 or $100.00 charging station might

1   come true much faster; secondly, the quality of

2   the technology due to, you know, one of the

3   things that interoperability does is it increases

4   competition, you know, there's many many

5   providers of WiFi, so they compete, and the

6   quality goes up, and the quality of the product

7   and the quality of the service goes up; thirdly,

8   there's an implicit thing that happens is that

9   the moment you have things that start to get

10   standardized, the volume of product goes up, it's

11   easier to justify, I mean, if I knew that there

12   was a certain standard, I mean, I'd go make a

13   certain semiconductor chip that can maybe do the

14   pulse with modulation signal, the PWM signal for

15   the Level 2 charging, for example, that feeds the

16   (indiscernible) standard. Maybe I'd make a

17   million of those, and so the volume goes up, and

18   so that results in this sort of -- it's called a

19   virtuous cycle, which Silicon Valley actually is

20   the expert on. And so are there disadvantages of

21   interoperability? I just think, again, I go back

22   to that I think we're in the early stages, so we

23   have to be very very careful not to put boxes

24   around innovation by way of the constraints due

25   to interoperability, you know, too early.

1   MR. WOLF: I will mention one thing

2   because I've spoken about this before and I think

3   I do want to strengthen -- I agree with all the

4   positives of it, but I want to strengthen what

5   Rajit just said. Twenty years of Silicon Valley,

6   lots of high tech companies, one of the key

7   things is not too early putting that box on and

8   saying, "Oh, we've got it. Now we're going to

9   start mass producing and increasing the volume on

10 this thing," because if we do it the wrong way,

11 we might have been doing just Microsoft and no

12 Linux, but we might have decided to do only Linux

13 and not allow any kind of MAC OS, or Linux, or

14 Microsoft. So it's a question of timing and what

15 the outcome will be, like someone said, we risk -

16 - and this is something that was mentioned here,

17 we risked losing some amazing innovations that, I

18 was just speaking to Bill at lunch, that the

19 backend side of energy services, so if someone

20 wants to integrate and come up with a solution

21 that's going to make charging free for everybody

22 because, I don't know, SMUD has now a smart way

23 to do frequency regulation and Demand Response

24 that's going to offset the price in their area,

25 but there's a vendor that can provide it to them

1 with the current pool of 1,000 cars, God bless if

2 they don't want to do it OCPP, but I think it's

3 too early to decide.

4   PROFESSOR GADH: Well, yeah, so two more

5 things. This is interesting that you're talking

6 about this because that's exactly the kind of

7 research coming out of my lab, so if the

8 standards preclude this kind of -- this specific

9 idea you're talking about is actually being

10 developed in my lab, and if any standard

11 precludes that from happening, so then that's a

12 negative. I want to add one more thing. You

13 know, venture capitalists should also be invited

14 to participate in such a discussion, the

15 Government doesn't have to take all the burden,

16 the financial burden, and I think if you bring

17 venture capitalists into the discussion here when

18 it comes to interoperability and standards, then

19 I think you're sharing some of the risk with

20 them.

21   DR. KRAMER: I think sometimes we take

22 maybe -- the role today, I think, is, yes, again,

23 I've said this before, we want to increase the

24 penetration of Electric Vehicles on the grid.

25 With that said, there's still quite a bit of

1   research and quite a bit of work that's been done

2   in many places, including the National Renewable

3   Energy Laboratory, and having the ability to have

4   these vehicles participate in Grid operations is

5   a huge part and will eventually have a huge play

6   in all of this; we've all known this for many

7   years. And I think as we look at research and we

8   look at the different types of standards that

9   might need to be developed, we have to consider

10 the distribution system itself, we have to

11 consider the utility, we have to consider the

12 person who is operating the vehicle. So from a

13 context of actually having all the different

14 types of new technologies play in the way that we

15 want them, we have many different roadmaps that

16 are before us here in the State of California, we

17 have a roadmap for solar, we have different

18 roadmaps for Electric Vehicles, and at some point

19 here we need to make them all come together in a

20 way that makes sense. And there is no one answer

21 to any one of the types of things that we're

22 trying to go after here, but I think in the end

23 trying to reduce our emissions and those types of

24 goals are extremely important and always have

25 been. So I think when I think of hardware

1 interoperability, my idea of hardware

2 interoperability goes past just the charger and

3 providing charging to the vehicle, it includes

4 down regulation if you're just charging the

5 vehicle. If it's a V to G vehicle, then that can

6 also perhaps provide voltage regulation or

7 frequency regulation if it makes sense. Each

8 answer has a different regional application. We

9 look at our distribution feeder systems, some

10 homes are served by one transformer for three

11 homes, some have multiple transformers for

12 multiple homes. What we see with electric

13 vehicles and hybrid vehicles is that we see

14 pockets, we see them growing up in little spaces

15 just like we saw from Ford's mapping there. So

16 we start to see these concentrations of vehicles,

17 it's not by per chance, we know that this is

18 occurring and a lot of it is societal, and if

19 you've got a car and you're my neighbor, and I

20 see that you're making money on it, or you're

21 having a good time with it, I might like to have

22 one, too. So we have to start to consider the

23 integration aspects of the vehicles and solar and

24 energy storage, these all play together, and they

25 play together in one place. When we look at

1 interoperability standards from a hardware

2 perspective, the thing that I would want to make

3 sure is that if public money is being put

4 towards, for instance, public charging, is there

5 should be a simple way to replace that charger

6 with something new. You know, you've got plug

7 and play, yes, to the vehicle, but what about

8 plug and play, you know, at the point of where

9 the station itself is? Are there easier ways to

10 make those types of connections? So we need to

11 look at the boundaries of the things we're

12 looking at; in this case, it's the hardware, so

13 if you're looking at the charger system itself,

14 you have power being delivered to it, you have

15 the potential of power being delivered back out

16 from that vehicle, especially in a home type

17 environment, so I think from a safety

18 perspective, yes, I think there has to be some

19 sort of physical hardware standards that need to

20 be lived by, but you don't want to keep them so

21 open that it's not safe -- to answer that first

22 question.

23   PROFESSOR GADH: So I'm going to add to

24 your comment on the hardware interoperability.

25 So for example, one of the experiments we are

1 doing is with Electric Vehicle, we are sending

2 power back to the homes, it's called V to Home or

3 V to Grid, and as we have embarked on this

4 journey, it's been a challenge because the

5 standards have not even been written in this

6 space, in the Vehicle to Grid. You know, we are

7 barely getting an understanding of charging

8 stations and having power flowing into the car,

9 power flowing out of the car is at best in

10 research labs right now and research

11 demonstrations. So what does that mean? It

12 means that we don't have a clear cut consensus or

13 conclusion on what interoperability even means in

14 this context, and so you know, the way I look at

15 it is, when you talk of hardware, hardware

16 interoperability, I mean, you know, a NEMA plug,

17 right? I mean, that's an interoperability

18 device, it's a very basic thing, but it's at the

19 hardware level, at the very basic level. And

20 communications basically, you know, are you

21 operating in the right frequency? Are you

22 operating if you have a WiFi, are you operating

23 at the right frequency, that protocol, and so on

24 and so forth. And then there's the data level

25 communications, right? For example, the kinds of

1 things we're talking about with open ADR, CP 1 or

2 2, and things of that nature. So I think that we

3 are barely able to get our hands around what it

4 is that needs to be interoperable when it comes

5 to this kind of an environment, and if you start

6 adding more and more, it gets more tricky. So,

7 again, going back to the same thing, I think that

8 from the standpoint of CEC, I think that there is

9 still a lot of investigation that is needed. I

10 think on the hardware level, there is

11 investigation needed right now before you start

12 to box in on the interoperability because, I

13 mean, some of that stuff is still behind, well

14 behind even the charging station technology

15 itself.

16   DR. KRAMER: And just for my colleague, we

17 finished a draft standard for V to G and it's up

18 on the NREL.gov website, it's more for the

19 interconnection to the utility and how to

20 evaluate the chargers. So we do have a draft out

21 there, you might want to go take a look at that,

22 it's a starting point, it doesn't address

23 everything.

24   PROFESSOR GADH: That's good, yeah.

25   MR. WOLF: At the risk of trying to cut to

1 the summary, because I see it's a tough hour,

2 people are quite quiet, I'll just give my kind of

3 take from the day about the two areas that we're

4 talking about here, one which is the

5 interoperability, we'll call it roaming, and the

6 other one is around the hardware. I think on the

7 roaming side, and I wasn't sure how the

8 discussion would happen, I think that's where, of

9 course, I have a vested interest as Collaboratev,

10 but I think, like on the other side, we shouldn't

11 dictate one thing, I don't want the State to

12 think that, you know, Collaboratev should be the

13 standard and everybody should be forced to do

14 that. I think we've established here and I don't

15 think anybody disagrees that credit card is a

16 good least common denominator that anybody can

17 choose, and it keeps everybody else honest. So I

18 think that when you go for solicitations and when

19 you go to see the outcomes of how you drive more

20 EV adoption, if you see a barrier in roaming,

21 allow multiple models to come and see if you want

22 to support it. Same thing on the hardware side,

23 we're hearing all these discussions which, to me,

24 is kind of the summary is it's all true, but it's

25 too early to say only, you know, that's something

1 we have to add to the stack of compliance that we

2 had before. Each solicitation that has -- and

3 I've been in five years in these solicitations --

4 has added new dimensions that weren't known

5 before, and in hindsight, we would have loved to

6 have them in on the first solicitation, but they

7 do cause some friction on the process. But it's

8 part of business, part of life, in all these

9 industries -- you mentioned WiFi -- I'm sure it

10 wasn't a decision that we're all doing WiFi

11 suddenly, there were the competing things, and

12 the market somehow said, okay, this is the least

13 costly. And then, from that point on, no one is

14 going to be stupid to do anything but that. But

15 I think that in both of these areas we should not

16 dictate in any kind of solicitation -- I do think

17 we need to support both areas, I think more

18 charges are needed, and I think roaming is

19 needed, but I don't think we need to dictate any

20 one solution that we don't have today.

21   MR. HAUSER: Just kind of adding on to

22 that, I mean, hearing the discussion and, you

23 know, what is the end goal or the end objective,

24 and how do we solve that, clearly we want to be

25 able to get as many EV chargers out there as

1 possible and we want side hosts to have the

2 flexibility to mix and match hardware with the

3 network management solution as they see fit, that

4 should spur on innovation and create, you know,

5 lower price points for everybody. So we should

6 all be happy for that. But going as far maybe as

7 specifying one particular standard over another,

8 you know, maybe it is too soon to do that, and

9 rather than picking that, what we should be doing

10 is listening to the criteria for what kind of

11 standard could be submitted. So, you know, maybe

12 it's royalty-free, you know, whatever the terms

13 are, but if we lay that criteria out for that

14 standard, then maybe that's the best of both

15 worlds and it allows multiple standards to be

16 able to comply with the end result.

17   DR. KRAMER: As with just about every

18 standard that I'm aware of, they take time. And

19 in the process of developing any kind of standard

20 or being involved in the standard, we have to

21 leave flexibility as we're proceeding through the

22 standard process. I mean, sometimes we'll have a

23 national standard and it can be viewed as slowing

24 progress down. And in many cases, it's because

25 of that standard that progress has moved forward.

1   So I think what we have to do is consider that,

2   if we do define standards, which standards are

3   required, we can't just say they're not going to

4   be, interoperability standards at whatever depth

5   we decide to take on, I think, is, yes, they need

6   to be flexible, but they also need to allow for

7   innovation within it while it's being developed.

8   I think there has to be means for demonstration

9   sites, for instance, very much like what we've

10   done on some of the other stationary

11   demonstration sites, to give that site more

12   flexibility as they're allowing that innovation

13   to be developed at their site. So I think, as

14   with any kind of standard development, you have

15   to have demonstrations, and you have to have

16   research that feeds those demonstrations. So I

17   think a well rounded program would be anything

18   from more the soft side all the way down to the

19   actual implementation side. I don't think that a

20   solicitation necessarily would require that you

21   would pick one thing. I think if you were able

22   to say here are four different areas, or four

23   different possibilities, or whatever that might

24   be given the amount of funding that's available,

25   you never really have to pick an answer. Any

1 time that we take State or Federal money and we

2 apply it to any type of technology area, we're

3 kind of driving it in that direction, we're

4 placing the vector in that direction. On the

5 start of something like this, being able to have

6 two or three or four vectors going out, to see

7 what happens with that, see where the

8 demonstrations might lead you, and then be able

9 to then kind of do a go, no go type of solution

10 and find your way to something that is more

11 market driven, but still allows innovation and

12 still, you know, you can sit here and say

13 proprietary versus open. There are benefits to

14 proprietary. There are benefits to open. Let

15 the market choose that direction. I think that

16 is -- but leave your solicitation open enough so

17 that enough data can be collected to allow us to

18 see into what the directions seem to be going in.

19   MR. HAUSER: Just one -- I'm sorry -- just

20 one point to that is I think part of the

21 challenge at the same time is education of the

22 consumers or the site hosts. You know, we can

23 say that on this side, but if they think they're

24 making an educated decision, but they're really

25 not, they might not be thinking ahead, and

1   there's been a number of instances where people

2   in the last year thought they might have been

3   able to have some flexibility with the system,

4   then they come to find out that they don't have

5   that, and that's because there's not a lot of

6   understanding or education in the market. So,

7   with that, and being able to provide those

8   multiple options, I think we run the risk of more

9   of the same, and we don't want to have the same

10   problem, like I don't want us to kick the can

11   down the road either. So with that also has to

12   come a full PR effort, if you will, to have

13   people aware of the differences in the options

14   and what they're getting when they make that type

15   of purchase decision.

16   PROFESSOR GADH: Yeah, and to add to that

17   comment, hardware standards, hardware

18   interoperability, let's look at SAE J1772 plug-in

19   and let's look at CHAdeMO. SAE is the Society of

20   Automotive Engineers Standard and there basically

21   are three power ports and two data ports, and one

22   of my students who was building some

23   communications between the EVSE and the car, he

24   looked at the communications, this was a few

25   years ago, and he said, "Wow, this is really very

1 trivial," or something like that, and so I talked

2 to him and basically he said that, you know, the

3 communications protocol is so basic that you

4 can't do a whole lot, and this is the protocol

5 today. And I said, "What do you mean?" He said,

6 "Well, if you compare it to what is possible in

7 the field of communications, this is very very

8 basic and if they were going to standardize this,

9 they could have added a lot more capability and

10 functionality within the SAE J1772 plug," so this

11 is now I'm talking only a few years ago. But

12 second is standard -- and it's not a standard,

13 it's the CHAdeMO protocol, right, the DC Fast

14 Charge protocol and, you know, in the DC side, we

15 have some challenges now between America, Japan

16 and Europe, and I think you guys are the experts

17 in that, and I guess we have expertise right

18 here, and once again, you know, there's a history

19 of where all of this is coming from, but we have

20 to be careful that, again, I mean, I look at SAE

21 J1772 and my students comment that, you know, in

22 two days, we could have had a very sophisticated

23 communication protocol between the car and the

24 EVSE, and we don't, and why don't we? So I think

25 we have to be very careful that, when we start to

1   set boxes, that we allow for innovation and

2   creativity and we don't stifle innovation and

3   creativity.

4   MR. LANGTON: Yeah. I think that's a good

5   point. I think it goes back a little bit to what

6   Bill mentioned about the benefits, the trade-offs

7   between proprietary and open standards, so J1772

8   is an open standard. So with an open standard,

9   I'll use OCPP just as an example, not to hold it

10 up in high regard, there had to be a balance

11 between the complexity and the applicability, so

12 the more functionality you toss on top of OCPP,

13 then the more costly it is for development to

14 happen at either end. So for any standard

15 there's going to be a tradeoff of that

16 functionality vs. implementation, and I think

17 that finding that balance is tough. And that

18 also is, at the end of the day, I think a

19 marketplace decision. So what is the

20 functionality that customers require? Does it

21 really require building the best mousetrap, or is

22 what we have available in an open platform

23 adequate to meet the needs of the marketplace?

24   DR. KRAMER: Sometimes standards, when we

25 use the word "standard," it sounds like, well, it

1 absolutely has to be this way. If you really get

2 into some of the standards, you'll see that

3 they're guidelines, you'll see that the set

4 points are open. They might tell you what the

5 set points they recommend you use, but they're

6 recommended settings. So be careful when we call

7 out a standard saying it must absolutely be this

8 way, it's always going to be this way, it's going

9 to look like the 110 Volt Plug, it's going to be

10 110 Volt Plug, and it's going to be the same

11 place everywhere, like in your home. What I'm

12 trying to indicate here is that a standard

13 typically gives a guideline, it's directing

14 someone in a design as to how to operate or put

15 something together in a safe manner. We still

16 have to have these types of standards, they are

17 required. But with that said, the way that they

18 are put together has to take into consideration

19 innovation in the future as they're being put

20 together. And I think in some cases we just --

21 we sign off on some standard and this is just not

22 a good thing for California, I don't think, is to

23 lay down the law and say, "It must absolutely be

24 this way." There are parts that it must be. I

25 don't know, I think from a safety perspective,

1   yes, for the equipment itself, even the

2   manufacturers themselves, have to meet you well

3   and have to meet certain requirements, and dig

4   even deeper into that and say, well, what are

5   UL's requirements? And so I guess when I look at

6   a standard and we're looking at interoperability

7   standards, it's more than just software, it's

8   software and hardware, it's software working with

9   hardware, it's not just one thing. It's not just

10   the cost of how to do a transaction, it's the

11   whole system. And I think in terms of

12   interoperability and a standard, I think it has

13   to take into consideration all of those legs of

14   the stool.

15   MR. WOLF: I have to keep talking. So,

16   Bill, you know, I don't want to challenge that, I

17   just want to ask a question on that. Because

18   it's such a complex issue to take all those

19   things in consideration, and there's things that

20   we don't know, do we wait until we get all the

21   smartest people and design that system to the

22   future, or do we continue evolving and knowing

23   that there's an evolution, there's some trees

24   that are going to be extinct over time, but

25   overall we're going to get to the right

1 direction. Because it seems very complex to do

2 that. I love all the backend energy services

3 stuff, I've been talking about it for years, V2G

4 and that, but it's not happening for a multitude

5 of reasons yet in the field; is it because we

6 haven't really thought through the problem

7 academically enough? Or is it just not mature

8 market-wise?

9   DR. KRAMER: Well, 1) we know how to

10 charge Electric Vehicles, Electric Vehicles are

11 here, there's no reason why people shouldn't be

12 using them, at least in Bill Kramer's opinion. I

13 think the cost points are here. It really comes

14 down to the individual owner as to what he or she

15 decides he wants to drive or what he or she wants

16 to put their money towards. Range, of course, we

17 all know is at least -- is not as long as it can

18 be for our regular vehicles, so, no, I think we

19 continue down the path that we are, but what we

20 don't want to do is we don't want there to be a

21 roadblock in the penetration of renewables -- or

22 of both renewables and hand plug-in vehicles,

23 actually. And those roadblocks, I think even if

24 you study both renewables and plug-in vehicles,

25 as I have, they do go hand in hand. So you don't

1 just stop progress, you don't just stop saying,

2 "No, we're not going to do it," but what we do

3 need to do is take a look and say, "Well, why is

4 the growth only this much a year? Why couldn't

5 it be bigger? What kind of incentives could the

6 State give in order for it to be bigger? Is it

7 really the charging station?" Maybe it's not, I

8 mean, that's not what I'm hearing today. I'm

9 hearing that most charging is happening at home.

10 But, you know, if there were more charging

11 stations at county locations, at companies, I

12 think, yeah, maybe there could be incentives to

13 be given to them to say, yes, maybe have your

14 employees incented so that they might have a

15 vehicle. What kind of other tax breaks might

16 they be able to see? Is it a tax break you want

17 to go after? It's the incentives to try to get

18 this technology out there -- it's here, why

19 aren't we using it? Together with any kind of

20 solicitation, you can try to meet the near term

21 needs and many times we rely on the market, you

22 know, if the market is stuck, then we use

23 standard government funding to get it unstuck if

24 we need to. Are we stuck? Is that why we're

25 stuck? I guess from my perspective, it's the

1 infrastructure and it's the education of the

2 users. Those seem to be two very large things to

3 me that are holding up the amount of vehicles. I

4 used to say in the '90s, I'd say to people, you

5 know, the only way we're going to make this work

6 is if we make this Electric Vehicle be part of

7 the home. It needs to look just like the washer

8 and dryer in my house so I can put it on my

9 mortgage. I still kind of think that way because

10 at that time, range was 100 miles, so it was kind

11 of a unique thing to be able to have a vehicle,

12 and you're still going to need two cars back then

13 because hybrids didn't exist. But being able to

14 find ways like that, I mean, I used to back in

15 the '90s say, you know, if gas is more than $2.00

16 a gallon, I should be driving this little

17 Electric Vehicle that I built. And you could

18 base it on, you know, you could base it on even

19 replacement with the battery. That kind of

20 information, I don't think, is really out there

21 in the public for them to make those kind of

22 choices. But to answer your question, a long

23 breath here, but you don't stop it, you still

24 move forward, you decide what is going to get you

25 the biggest bang for the buck, you set your

1 goals, you set realistic goals, and then you

2 drive yourself towards those goals and reset

3 them, you know, as you need to.

4   MS. ALLEN: There's a lag time. Maybe if

5 I can distill this down to one question. So we

6 have a lot of different things that we have to

7 consider when we put together a solicitation, I

8 mean, there's a lot of things that drive the

9 needs for Electric Vehicle charging other than

10 just us considering interoperability. So maybe

11 the question is, is it too early to be adding

12 that into our solicitations at this point? So

13 like I said, there's a whole lot of other things

14 that we have to consider -- is this something

15 that we should be considering in our solicitation

16 at this time, today? You know, maybe six months

17 from now your answer would be different, maybe a

18 year from now your answer would be different, but

19 for right now, is it time to start putting that

20 in? Or is it too early?

21   MR. HAUSER: I would -- you know, whether

22 I'm answering now, six months, or a year from

23 now, I think my answer would clearly be yes. I

24 mean, again, we're in a nascent space, there's a

25 lot of innovation that's still to come, and

1 whatever we're putting out today has to have

2 flexibility and scalability, and if every time we

3 put out a set of hardware and network solutions,

4 and they can't move or evolve as the technology

5 improves, for whatever reason, then we're

6 limiting ourselves, we're never building on top

7 of what we've just done, we always have to go

8 back and fix everything we've just done, and then

9 you never get past the starting blocks. So I

10 think it's very important. I mean, again, in the

11 short term, when we said this before, and I'm

12 sure we said it many times, so I apologize for

13 being redundant, but it increases innovation,

14 lowers costs, gives site hosts the flexibility

15 that they need to make decisions today that they

16 think are going to meet their business needs.

17 But as their business evolves and they get a

18 better understanding of what their consumers or

19 what their constituents want or need, and we've

20 all said there's not enough information out there

21 right now to be able to definitively say what

22 that is, they need to be able to change and

23 whether that's getting a different -- having the

24 current system do something different, or moving

25 to a new software system altogether, for a number

1 of management, they have to have the ability to

2 do that. And if we don't take initiative now to

3 make sure that they have that flexibility, I

4 think we're going to look back and we'll see

5 that, you know, "Electric Vehicles: What could

6 have been?" You know, what could we have done

7 better to actually make it happen? Because I

8 think there will be enough people that will get

9 frustrated out there, workplaces, public

10 locations will find it too expensive to keep re-

11 doing this, especially when utilization rates for

12 public infrastructure, you know, from reports

13 that have been published, there's still only five

14 to 10 percent at best, so we've got a long ways

15 to go and we need these people. So we need to

16 know that the charge stations we're putting in

17 today are going to be good five and 10 years from

18 now.

19   PROFESSOR GADH: So about a year ago, I

20 had a slide that showed all the EVs you could buy

21 in the market. I updated that slide last week.

22 The number of EVs has more than tripled in one

23 year. The sophistication of the technology in

24 the EVs has also kept pace. The new EVs are more

25 efficient, they can go faster, so the EV and, I

1 guess, our two EV experts have I guess left, so

2 the EVs are innovating at a rapid rate on their

3 own, the EVSE there is innovation happening, you

4 know, I go back to Matt's comment -- I guess he

5 also left -- where are we headed to? We want

6 more charging stations, faster, better, cheaper,

7 interoperable so that they work with the cars,

8 that's the most important, they've got to work

9 with the cars. And so that interface itself,

10 right, SAE J1772, CHAdeMO, Combo, whatever it is.

11 So all of those require innovation and so there

12 will be an iterative cycle. You have these

13 requirements, you have the EV, you have the EV

14 owner, and you put out something, then there will

15 be a feedback loop, and the feedback loop will be

16 based on the EV and the EVSE, both. So there's

17 the customer, there's the driver, EV, and EVSE,

18 they will use the technology and it will

19 iteratively prove. So no matter where I am in

20 time, that will be an infinite loop and it's like

21 the computer, when is the right time to buy a

22 computer? Right? If you've been waiting for

23 something a little bit faster, you always get

24 something faster, so the same thing is going to

25 happen here. The trick is -- and that's the

1 thing that, for example, in U.C.L.A., I told my

2 students many years ago, I said, "Can you think

3 of our research in U.C.L.A., our Smart Network,

4 as separated hardware and software?" So that's

5 my approach -- that was my answer to that

6 problem, and that's how I've architected my

7 solution. And I'm assuming that's what a lot of

8 the other companies are doing. But I think

9 innovation is going to be continuous.

10   MR. LANGTON: So I'll just add on, I mean,

11 I agree with Brett's point, I think another way

12 of looking at it is, rather than say is the

13 market too early to adopt, you know, open

14 interfaces or adopt the ability to grow, I

15 actually would say that's an exact reason we

16 should be able to do adopt that. I mean, it's a

17 nascent industry, we have some experience, and

18 we're gaining experience every day, but I think

19 we are now saying that the industry shakeups are

20 still happening and will continue to happen, the

21 addition of new standards, new hardware players

22 coming in and coming out, so if we want to

23 enhance that competition, enhance that future

24 value, we're going to have to provide the

25 openness in the networks.

1   PROFESSOR GADH: Can I add one more thing?

2   I have an Apple and I have an Android device,

3   both in my bag, I use both at the same time.

4   Apple is completely closed, the Android

5   completely open, but both are very innovative,

6   and so I think, you know, we have to keep that

7   innovation in mind, as well, as we're thinking

8   about our investment decision.

9   MS. ALLEN: Let me just expand this just a

10   little bit more, just to sort of focus the

11   answer. So there are certain things in

12   interoperability that we know we have to do. We

13   have to say it has to be this in order to be able

14   to talk to the car, it has to do this in order to

15   do this; so there are some basic things that we

16   know now we have to do in order to make these

17   usable. And we can't predict, you know, we're

18   not going to try and predict what the automakers

19   are going to be making at some point; however,

20   there are some areas that we've talked about

21   today that are a little bit more flexible, we can

22   either say it has to be this or leave it open,

23   and so I've heard both sides, I've heard let the

24   market decide on some of these things where

25   everything is still up in the air, or add in a

1 little bit of some requirements so that there is,

2 for lack of a better term, what the legislators

3 like to call the avoidance of risk, or our

4 ability not to encourage the possibility to the

5 extent we can of having any stranded assets, even

6 though it may be that a stranded asset today is

7 really not a stranded asset tomorrow because

8 three-quarters of the cost is in the

9 installation, so you just pull out the pedestal

10 and you put in a different pedestal, and you're

11 on your way again. But for a small period of

12 time, you know, there are going to be folks out

13 there that are going to say, "Look at what you

14 did, you could have prevented this." So do we

15 need to worry -- for those things that are up in

16 the air, should we be worrying about that today

17 in our solicitations?

18   MR. WOLF: Well, I think, you know, let's

19 look at a similar -- at the industry on the car

20 side, we invested in Coda, invested in Fisker,

21 invested in Tesla. Overall, would anybody doubt

22 that the investment in those categories --

23 somebody spoke about vectors -- was a smart

24 decision? We didn't choose, we didn't say,

25 "Well, Tesla is going to be the winner, let's put

1 all our money there." We invested in multiple

2 things and so did the Federal Government. I

3 think there's no -- I don't think with time that

4 there's any disagreement here, I think the

5 question is a judgment call because it's when is

6 it ready. We spoke about the car, the charger,

7 the NOC, the Network Operating Center, the data,

8 and the energy side, there's kind of a level of

9 maturity that these things are happening like

10 geological layers, and they kind of become -- as

11 they go down, they become more compressed and

12 more standardized. Rushing it creates problems

13 because it creates situations that, "Oh, we don't

14 have enough communications in J1772," but there's

15 also positives because now everybody knows what

16 the marching orders are and they move ahead. So

17 no one is going to argue that there's no

18 positives without a cost. I think, when I look

19 at that question, you've got the two questions

20 you asked, should you even solicit for EVSE

21 deployment at this point? Should you solicit for

22 roaming, basically provide funding for those

23 things? And if you do, should you put

24 requirements beyond the ones that you're talking

25 about, the basic basic ones? What else should

1   you add from last time? Based on what I've heard

2   today, I think that you're talking about a

3   potential on OCPP, on the hardware side, I think

4   you're talking about a potential for NEMA on the

5   roaming side, but I don't think you can mandate

6   those things yet in solicitations and I don't

7   think you should stop soliciting for those areas.

8   DR. KRAMER: In the development of any

9   kind of standard, what many of us seem to

10 sometimes lose sight of is the process. You have

11 multiple disciplines here. Even from an

12 engineering perspective, it's hard to find that

13 student who has communications, power electronics

14 background, and network background -- very

15 difficult. We're not there yet, okay? Try to

16 find one person who has all of that knowledge

17 rolled up in one place, there's very few. When

18 you're bringing together people from disparate

19 technology areas, even in the same company, the

20 process of developing the standard whereby there

21 is a place where people can come and they can

22 discuss what they think is the best way to go

23 about it, or they're evaluating different

24 methodologies, don't -- you have to always

25 consider the fact that it's the process of

1 developing the standard that brings people of

2 different companies, different disciplines,

3 education comes together, industry comes

4 together, this is an opportunity for you to stay,

5 if you will, current. So when you are in the

6 process and you're supporting or you're

7 developing any kind of standard, including an

8 interoperability standard, that process of being

9 involved in that process and being part of it,

10 and being a member of it, or attending it,

11 there's quite a bit to be said about how that can

12 help. But again, it takes time to develop

13 standard, okay? You don't want to slow yourself

14 down for innovation. My answer is yes, so I

15 think you've got a yes from all of us that that

16 should be included in -- at least we believe it

17 should be, at least this panel believes so.

18   MR. CHILDERS: I have two questions and I

19 want to restrict this to just the EVSE to network

20 side of this discussion, and that is, with OCPP

21 and all these other standards we're talking

22 about, is it not true that they evolve? That is,

23 if someone comes up with an innovation, or

24 additional data to send back and forth in the

25 future, that you all get to go to the OCPP

1 meetings, suggest it, argue for it, and it

2 evolves. So it's not static, it does allow for

3 innovation in the future, and that's true of all

4 our wireless, J1772, all of these standards. So

5 it wouldn't be static or as restrictive, I think,

6 as some of you have portrayed. And my second

7 question is this, would it not be possible for

8 the solicitation to require a basic mode in which

9 the EVSE operates and meets OCPP, and then a

10 proprietary mode that might be EVSE with an

11 additional message set that somebody may think

12 that they want to do, as long as the host could

13 walk out, hit a jump or a switch, and have it

14 revert to some basic OCPP mode? I don't think

15 that would add a lot of cost to the EVSEs and it

16 would solve our problem and make them universally

17 applicable if something went wrong with a

18 particular proprietary entity. So first question

19 is, don't these things evolve? Second is,

20 couldn't we require just the ability to operate

21 in a basic OCPP mode and allow for innovation in

22 a separate mode, but that it reverts? So what

23 does the panel think?

24   MR. HAUSER: I'll take the first question.

25 You're absolutely right. I mean, right now,

1   let's see, the first version of OCPP, which was

2   1.2, was released in 2010, 1.5 was released in

3   2012, and then in October of this year, 2.0 will

4   be released and we'll be testing by the end of

5   the year, and then we'll have a lot more

6   functionality and added messages and the whole

7   roadmap, and the specification list will be

8   distributed in October, but it certainly is, to

9   your point, it's a dynamic protocol and it is one

10 that everyone is open -- welcome and open to

11 participate in when they have to get together for

12 their workshop, meetings, however many times a

13 year in person, and then over teleconferences

14 when required. So that's for sure. And then the

15 second question was, is it possible to have

16 multiple standards on a charge station? My

17 initial thought -- and anyone else can jump in

18 here -- is what you're talking about really for

19 like an open standard protocol, it's the whole

20 Communication Port, or Com Port, so in theory you

21 might have to have a second board in there to be

22 able to allow that to happen, which would

23 increase the overall cost of that charge station.

24 So there might be a barrier to cost to being able

25 to do that, but I think from a functionality

1 perspective, that could probably be done. But

2 I'm not the hardware engineer, so help a brother

3 out, please.

4   MR. LANGTON: Yeah, so I actually -- I

5 like the second idea, so I agree with Brett on

6 question 1, so, yes, it's a dynamic and evolving

7 standard; and on the second piece, so what you're

8 basically saying, and I had the same thought, was

9 provide some basic level of functionality, and

10 then, as you talked about, if there's something

11 that -- that provides the protection from vendor

12 lock-in and the future proofing and the stranded

13 assets, which I think we're misusing a little

14 bit, but the stranded assets, and then the

15 enhancements can be made on top of that, which

16 would provide that functionality, which would

17 maybe be that special sauce that would enable not

18 just competition, but if that's what the standard

19 becomes in the future, then we grow from there,

20 so we grow in that direction. So it would

21 provide a certain baseline level functionality,

22 and I think that's more of a software issue than

23 a hardware issue.

24   MR. LOWENTHAL: I agree with that last,

25 but I think the way you would do it, rather than

1 implement two standards, is have a standard and

2 then some enhancements that go beyond the

3 standard and find some escape mechanism within

4 the standard that lets you do these enhanced

5 functionality. That's what we would need to do

6 today, just for instance to implement 2.0 before

7 it's an agreed to standard, right? So you do 1.2

8 with extensions that brought you to the 2.0

9 functionality. So I think that works well.

10   MR. LANGTON: And we do that for customers

11 now, too. So for instance, mainly in Europe, so

12 Demand Response and things like that aren't part

13 of OCPP, but we're integrated with customers who

14 have that as part of their portfolio, so we can

15 add additional message sets next to the base

16 level of OCPP functionality, through the same

17 channel basically.

18   MR. CHILDERS: Yeah, I think that makes

19 perfect sense.

20   MR. WOLF: I think, a) all these standards

21 are dynamic and change, I think that's actually a

22 brilliant idea because you don't require

23 necessarily all the features set, but you require

24 a minimum set that the Government knows today,

25 might lead to no stranded assets in a worst case

1 scenario, which is not the common scenario, but

2 you have a certain -- it might be a very

3 interesting solution that came out of today.

4   MR. CHILDERS: Does this address

5 everybody's objections to a solicitation that

6 might require that ability? Or is there

7 something I'm missing here? You could run

8 proprietary on top, but it has to be able to

9 revert to OCPP?

10   PROFESSOR GADH: I just want to add, you

11 know, OCPP is one particular protocol, there are

12 other protocols out there, and you know, the way

13 I look at innovation, innovation, I mean, the

14 protocols are the interfaces, that's the easy

15 stuff, I mean, anybody can write that language,

16 but I think that, I mean, there's like we've

17 talked about Step 1 or Step 2, and things like

18 that. I think the question is that, if you make

19 that a requirement, are you being too

20 restrictive, are you precluding some other folks

21 that are creating interface along some other

22 standard interfaces because there are other

23 standard interfaces, as well, like, you know, the

24 Madrine 5 (ph), so on and so forth. I mean, I

25 would suggest that, you know, you may want to

1 have a broader list of standard that you can

2 write to.

3   MR. CHILDERS: Well, is there some

4 compelling reason that I would pick another one

5 as the basic standard that it would be able to

6 revert to? I mean --

7   MR. LOWENTHAL: I'll answer from us -- no.

8 I think at this point, we can see that OCPP is a

9 good direction and we've already made the

10 decision inside, at Chargepoint, to support it.

11 So our only hesitation actually is its state of

12 development. I don't see a challenger to it.

13   MR. CHILDERS: So I think what I'm hearing

14 is there will be very few objections if we

15 require that it run only -- only -- only OCPP

16 with no additional proprietary messages --

17   MR. LOWENTHAL: That's a problem.

18   MR. CHILDERS: -- that would be a problem.

19 But if we allow this flexibility to run

20 proprietary on top of OCCP and the ability to run

21 basic OCPP, that I don't see any objections in

22 the room, right?

23   MR. LOWENTHAL: That's right.

24   MR. WOLF: It's kind of like a DOS and

25 Windows situation. That's a good analogy for

1 that industry and it didn't allow a huge amount

2 of innovation happening on top of Windows, and it

3 also was a basic thing you could do.

4   MR. CHILDERS: I could run backwards

5 compatible down to a certain base level.

6   MR. LOWENTHAL: So I wanted to add another

7 comment. So I sat in the discussions on the

8 National Electric Code and also for the

9 California Green Building Code, where they wanted

10 to mandate something on building and charging

11 infrastructure for new parking lots. And right

12 now in the Green Building Code in California,

13 it's optional, although Los Angeles has adopted

14 that as mandatory, Santa Clara County soon will,

15 the City of Sunnyvale did, whatever. And they've

16 had a lot of these discussions and basically what

17 they came down to is the only thing they could

18 mandate is conduit. But putting in conduit

19 reduced the cost of installation by 50 percent

20 because the retrofit cost of putting that in

21 later is horrible. So if you find common ground

22 -- maybe the only common ground you find is

23 conduit, and that's the only thing the State can

24 pay for at this point because it's the only

25 common ground we could find, but at least that's

1 very critical question -- in North America. Does

2 anyone know?

3   MR. LOWENTHAL [presumed]: In North

4 America, there's got to be probably under 1,000,

5 for sure, but in Europe there's over 6,000.

6   MR. CHERKAOUI: -- are based on OCPP.

7   MR. HAUSER: Yeah, I actually believe it

8 to be a bit higher than that.

9   MR. CHERKAOUI: No, I can guarantee you

10 it's not. In fact, it might be even very much

11 lower. Just to give you a simple example, the

12 largest network is in Paris, it's all running in

13 Microsoft embedded. Just that is 6,000 stations

14 in that, which OCPP has about 2,000 out there.

15   MR. WOLF: And (indiscernible) is

16 definitely not OCPP.

17   MR. CHERKAOUI: Nor is RWE, which is one

18 of the big networks.

19   PROFESSOR GADH: How many in the USA?

20   MR. CHERKAOUI: I do not know for North

21 America.

22   MS. ALLEN: So I think we're running out

23 of time, so this will be our last --

24   MR. HAUSER: I will just make one comment.

25 The European Union, and I can't remember the name

1 of the body, I can look it up, but all future --

2 ISO -- no, not ISO -- has mandated that any

3 Government funding that's provided for the use of

4 purchasing and installing Electric Vehicle

5 infrastructure has mandated now that OCPP be used

6 within those charge stations.

7 　　　　MR. CHERKAOUI: [Indiscernible].

8 　　　　MR. HAUSER: Based on your accent, I'm

9 going to give you the benefit of the doubt there.

10 But I do -- I'll just double-check the document

11 that --

12 　　　　PROFESSOR GADH: I'm just concerned that

13 -- I'm going to go back to my comment -- are we

14 constraining things too early? Are we

15 constraining creative ideas too early? At a very

16 broad level, that's the only statement I would

17 like to just caution everyone about.

18 　　　　MR. LANGTON: Right. So I think, you

19 know, this is also Question 3, so OCCP, while

20 it's mandated open source, it's become the de

21 facto of those open sources, and a lot of those

22 actual projects are really private projects, as

23 well, so it's not just governments, but utilities

24 or private network operators who want to deal

25 with the scale, and then really at the base level

1   they want to be able to use multiple vendors are

2   requiring that standard, and it's become the de

3   factor standard as a result of that.

4   MR. HAUSER: And I'm sorry I blurted out

5   ISO before because that -- I thought you were

6   answering other questions of John's, but the

7   organization that most likely we'll take up, the

8   SD that we'll take up OCPP, is probably the ISO.

9   MR. WOLF: But I think that, listen,

10   you've got one of the larger players that's got

11   the most charge spots in the world, they're

12   deployed, you've got the software players, the

13   hardware players, you should pull the other guys,

14   the GE's, the Eaton's, and that, and if you don't

15   get any objection and you propose a set of things

16   that will allow you to revert back, then no one

17   is going to come in in hind sight and say that

18   was stupid. So, you've made something very -- I

19   don't usually see such progress in a daily type

20   discussion, but it's really interesting that we

21   could potentially put something in place that

22   doesn't achieve everything, but it allows to

23   safeguard any kind of fallback that is in the

24   industry.

25   MS. ALLEN: Okay, so I think we're going

1 to close on that very positive remark.

2   MS. BAROODY: Thank you, Jennifer and

3 Elise for monitoring that panel. And thank you,

4 Panelists, we really appreciate your time today

5 and your wisdom. We'll just give you a hand.

6 [Applause] So I don't know that we have any

7 public comment. Do we have any public comment?

8   MS. KEDDIE: Do you want to check the

9 sign-up sheet outside?

10   MS. BAROODY: Jennifer, do you want to

11 check the sign-up sheet out there just in case

12 somebody appeared? What about on the webcast?

13 Nobody there.

14   MS. KEDDIE: People have been watching

15 this by webcast, but there have been no questions

16 asked as part of that.

17   MS. BAROODY: Okay, so we had no public

18 comment, so I'm going to wrap this up really

19 quickly. I just want to thank everybody for

20 coming today. I thought it was a very productive

21 day. I know we learned a lot and I hope everyone

22 here learned a lot from one another. I also want

23 to thank Elise and her staff for helping set this

24 up today, thank Air Resources Board, Cal/EPA for

25 this room, it was perfect. I want to thank our

1 note takers, they've been working diligently all

2 day, Charles Smith and also Than Lopez, right

3 there, thank you very much. And we will have

4 notes from today and we will post them on our

5 website.

6   So our next steps are we have some

7 solicitations to put out, now we are better

8 informed on doing so. And please stay tuned via

9 our Listserv, so I encourage you to sign up on

10 our Listserv, it's fairly easy to do, just go on

11 our website, put in your name and email, and we

12 will be in touch. Let's see, I think that's it

13 for today. Thanks again.

14   (Thereupon, the Workshop was adjourned at

15   3:40 p.m.)

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